Approach to Tremor in Older Adults

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This article will assist the clinician in defining and categorizing tremor, also suggesting key questions and physical examination techniques to facilitate a probable diagnosis in an older adult. The role of many drugs in the causation and exacerbation of tremor is discussed and the treatment of several specific tremor disorders is reviewed.

Key words: *essential tremor, postural tremor, kinetic tremor, enhanced physiological tremor, parkinsonism*

Introduction

Tremor is an important and frequent symptom/clinical sign among older adults and requires a logical approach to diagnosis. There are many different causes of tremor, with postural/essential type tremor being the most common. Once an accurate diagnosis is made, specific treatment can be effective.

It is important for clinicians not to assume that tremor implies Parkinson's disease (PD); each year this author encounters several older adults who have been erroneously diagnosed and treated for PD.

Prevalence

Movement disorders rank among the most common neurological diseases. In a study by Wenning *et al.,*[1] 28% of the individuals studied who were age 50–89 years had a movement disorder, a proportion that increased sharply with age to 51.3% among 80–89 year olds. Prevalence of tremor overall was 14.5%, followed by restless leg syndrome (10.8%) and parkinsonism (7%). Essential tremor (ET) is the most common movement disorder among older adults and has a reported prevalence of 4% in a community population above 65 years of age.[2] Interestingly, > 70% of cases were previously undiagnosed.

Definitions

Tremor

Tremor may be defined as a rhythmic oscillatory type of involuntary movement produced by contraction of reciprocally innervated muscles. Among older adults, it must be distinguished from other disorders, including the following.

Asterixis

Asterixis or "flapping tremor," is most readily demonstrated by asking the patient to hold arms outstretched with the hands dorsiflexed. First described with hepatic encephalopathy, asterixis also occurs with hypercapnia, uremia, and other metabolic encephalopathies.

Myoclonus

Myoclonus, which are brief, shock-like muscular contractions, may be benign (for example, occurring physiologically as we fall off to sleep or awaken) or may be more severe, due to underlying central nervous system pathology or a variety of drugs such as narcotics.

Dystonia

Sustained involuntary muscle contractions.

Chorea

Rapid, random flowing movements.

Akasthisia

Akasthisia is a subjective state of motor restlessness usually occurring among individuals taking certain neuroleptics (for example, haloperidol).

Tardive Dyskinesia

Tardive dyskinesia involves mouth, tongue, and chewing movements associated with at least three months of neuroleptic exposure.

Tremor may be further described based on amplitude (that is, fine, medium, or coarse) and frequency[3] based on oscillations per second (see Table 1).

Categories of Tremor

The main classification[3] of tremor includes two major types.

Rest Tremor

Rest tremor, typical of parkinsonism, has a frequency of 4–6 hertz, a coarse amplitude, and is classically referred to as the pill-rolling tremor of the hands.

Table 1: Frequency of Various Tremor Types

Low Frequency (<4 Hz)	Med. Frequency (4–7 Hz)	High Frequency (> 7 Hz)
Cerebellar tremor	Essential tremor*	Essential tremor**
Rubral tremor (define) occurs with midbrain injury.	Parkinsonian tremor	Enhanced physiological tremor
	Psychogenic tremor	Orthostatic tremor
		Psychogenic tremor

* typically among older adults these relate to Table 1
** typically among younger individuals; see Table 2

Table 2: Differential Diagnosis of Rest Tremor

Parkinson's disease
Parkinson-plus syndromes (e.g., progessive supranuclear palsy, multi-system atrophy)
Secondary causes of parkinsonism (e.g., drug-induced parkinsonism)
Severe essential tremor

Rest tremor is best observed when the limb is in a fully supported position and the patient is encouraged to relax. The parkinsonian tremor is characteristically worse with anxiety or mental stress and usually disappears during sleep. The resting tremor of PD typically first appears in one hand, spreads to the ipsilateral leg, and then to the contralateral side. A rest tremor of the tongue, lips, and chin may also be present in PD. For a differential diagnosis of rest tremor, see Table 2.

Action Tremor

Action tremor is any tremor produced by voluntary contraction of muscle and includes several subtypes (Figure 1).

Postural Tremor

Postural tremor is present while voluntarily maintaining a position against gravity, for example when holding the arms outstretched, or when the individual attempts to drink from a cup held closely to the mouth. See Table 3 for differential diagnosis.

Table 3: Differential Diagnosis of Postural Tremor

Physiological tremor
Enhanced physiological tremor i.e., see Table 7
Essential tremor
Drug-induced tremors (examples of drugs listed in Table 7)
Metabolic disorders
Hypoglycemia, thyrotoxicosis
Later stages of Parkinson's disease

Kinetic Tremor

Kinetic tremor (Table 4) occurs during any voluntary movement. It may be either a simple kinetic tremor, which occurs throughout voluntary movement and is demonstrated by simple pronation/supination movements or flexion/extension of the wrist, or intention tremor, in which tremor amplitude increases substantially during the pursuit of a target or goal. Intention tremor usually implies a cerebellar etiology and is best demonstrated by finger-nose or heel-shin testing.

Task-Specific Kinetic Tremor

Task-specific kinetic tremor occurs during specific activities, such as primary writing tremor and orthostatic tremor (the latter is limited to the legs and trunk and occurs exclusively during standing).

Isometric Tremor

Isometric tremor occurs as a result of a muscle contraction against a stationary object such as when making a fist or squeezing the examiner's hand.

Key questions to ask patients who present with tremor and key points of the physical examination to assess tremor are outlined in Tables 5 and 6.

Table 4: Differential Diagnosis of Kinetic Tremor

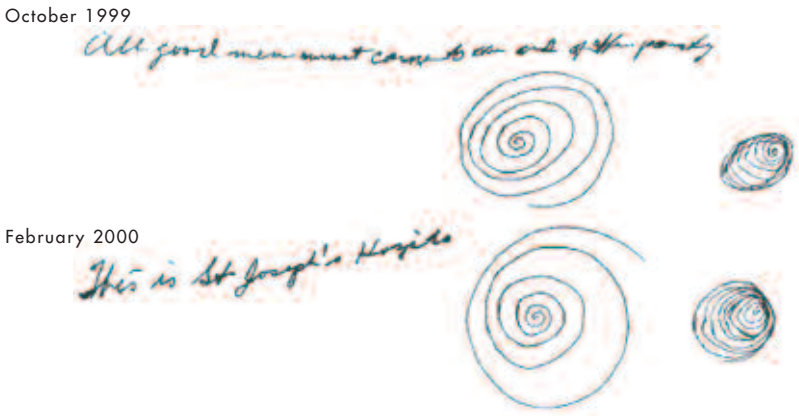
Cerebellar disorders, e.g., multiple sclerosis, stroke, etc.
Mid-brain stroke or trauma (rubral tremor)

Treatment of Tremor: Basic Principles

First, remove any causative factors. Decrease the dose or discontinue offending drugs such as decongestants and salbutamol. Individuals with enhanced physiological tremor should be encouraged to decrease their intake of caffeine. Keep in mind that those with minor symptoms may not require specific treatment.

Educate patients, wherever possible, regarding the cause of their tremor and involve them in mutual treatment decision-making. Try to improve the patient's general physical and emotional health by treating anemia, depression, and other conditions. Involve physiotherapists and/or occupational therapists as appropriate for the provision of exercise programs, daily living aids, and the like. Individuals with unusual or severe symptoms should be referred to a neurologist, geriatrician, regional movement disorder clinic, or other appropriate specialist.

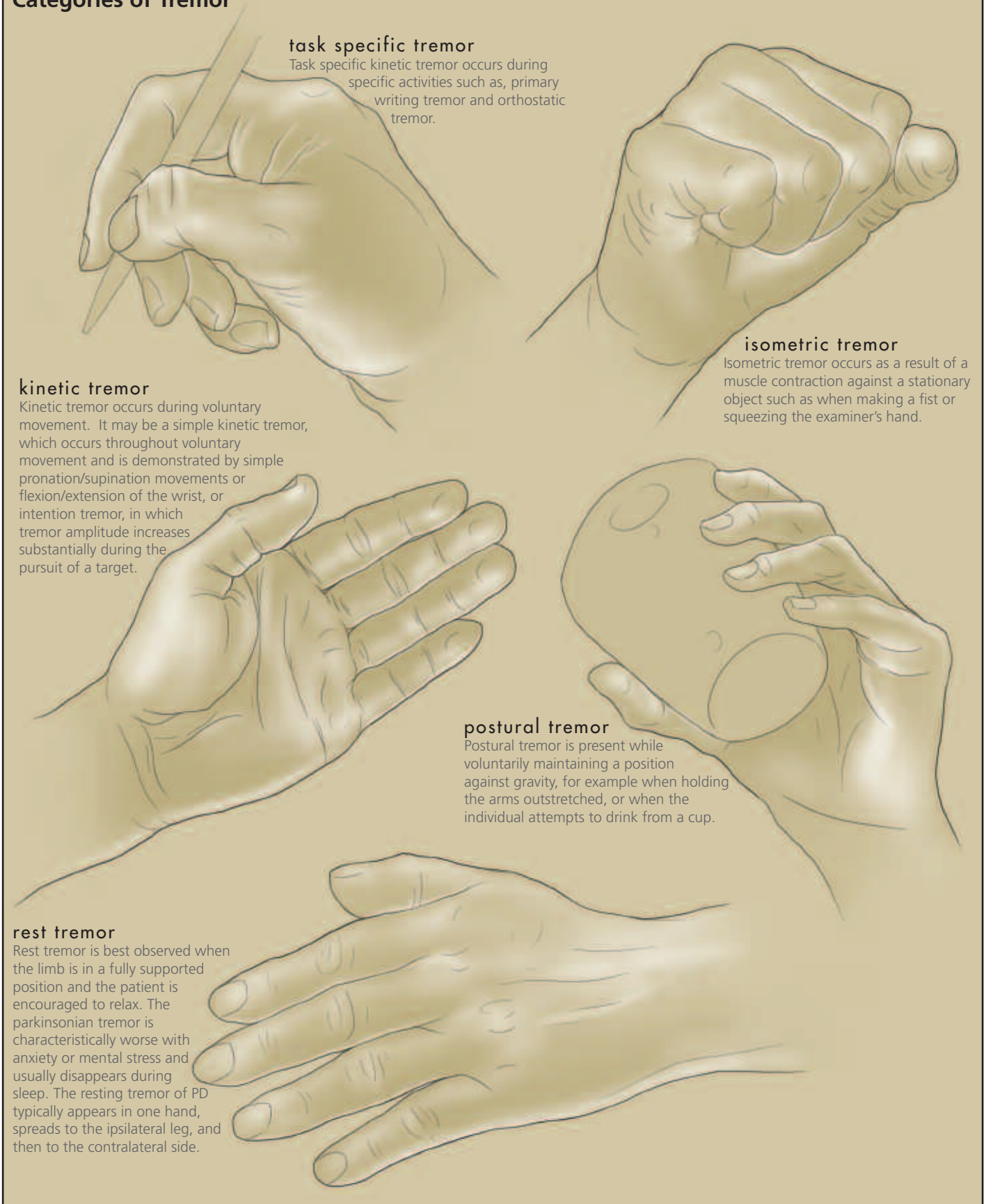
Figure 2: Hand-writing Samples



This patient has PD. October 1999 is before treatment with levodopa was started and February 2000 is after levodopa treatment. Both swirls on the right hand side are small and characteristic of PD. Hand-writing samples show micrographia but the second, post-treatment sample is somewhat improved.

Source: Courtesy Dr.Joel Hurwitz

Figure 1:
Categories of Tremor



Drug Treatment of Specific Tremor Disorders

Essential Tremor

Essential tremor (ET) is the most common form of tremor. Approximately 50% of patients have a positive family history (so-called familial tremor). It can occur at any age with bimodal peaks in the second and sixth decades. There is typically a symmetrical postural and kinetic tremor, most frequently affecting the forearms and hands. Muscle tone is normal with no bradykinesia or ataxia. The tremor frequency is often lower among older people so that the condition is sometimes confused with PD. The arms are affected in about 95% of cases, there is head tremor in about one-third of cases, and less frequently there is involvement of the voice, legs, and face. Essential tremor develops insidiously and progresses slowly over several years.

The two most commonly used drugs to treat ET are beta-blockers and the anticonvulsant primidone. Both have frequent adverse effects among older adults and the beta-blockers are contraindicated with asthma or significant reactive airway disease. Both beta-blockers and primidone are more effective for limb tremor and less effective at reducing voice and head tremor. The classic beta blocker is propranolol, started among older adults at a dose of 20–40 mg t.i.d. but doses in excess of 320 mg per day do not provide any additional benefit. In Ontario, (as in Manitoba, New Brunswick and Newfoundland) the once per day LA formulation of propranolol is not covered as a limited use medication. Metoprolol and atenolol have also been shown to be effective against ET. Primidone needs to be started for older adults at a low dose of 62.5 mg taken at bedtime. Doses in excess of 250 mg per day may result in unacceptable side effects, especially ataxia.

A variety of other medications may be tried, including gabapentin, carbonic anhydrase inhibitors, and benzodiazepines, none of which have shown consistent usefulness in double blind trials. Benzodiazepines used chronically by older adults often worsen cognition and increase falls. Botox injections, administered by movement disorder specialists, can be effective for head and voice tremor.

Enhanced Physiological Tremor

A predominantly postural tremor, enhanced physiological tremor is often associated with various conditions

Table 5: Key Questions to Ask Patients Regarding Tremor

Ask the patient to describe the situations when tremor is most evident. For example, essential tremor and other postural tremors are typically worse when trying to drink from a glass or spoon, or when carrying a cup. Conversely, alcohol usually ameliorates this type of tremor.
Enquire regarding other neurological symptoms, such as slowing of gait, difficulty with fine motor functions (such as buttoning a shirt), drooling, or changes in handwriting (micrographia). These are all features of PD.
Obtain a thorough medication history, including both prescribed and over-the-counter preparations. Always ask about caffeine and alcohol intake, as well as other lifestyle substances.
Ask about family history—although ET occurs sporadically, it is often inherited. There is a positive family history in at least 50% of all cases and the genetic transmission seems to be autosomal dominant with variable penetrance. Conversely, PD usually occurs sporadically, although persons with a first-degree relative (mother, father, brother, sister, or child) with PD are at three times greater risk for the disease.
Ask how alcohol affects the tremor. About 50% of patients with ET notice improvement after consuming alcohol. Cerebellar tremor typically worsens. Alcohol abuse and withdrawal also may cause tremor.

Table 6: Key Physical Examination Points Regarding Tremor

Take a hand-writing sample (see Figure 2). – Individuals with PD have micrographia (script becomes progressively smaller and falls below the line). – Individuals with ET have shaky but normal sized script.
Look for goiter and signs of hyperthyroidism.
Look for head tremor. This occurs in ET, cerebellar disease (titubation) but not in PD.
Look for jaw tremor. This is seen in PD but not ET.
Look for tongue tremor. A coarse tremor, seen when the tongue protrudes halfway out of the mouth, is a feature of PD.
Examine the patient's speech. – Wavering/quivering is consistent with ET. – Hypophonia (a low intensity monotone) is consistent with PD. – Scanning dysarthria occurs in cerebellar disease.
Check for hand and limb tremors (see above).
Check for associated cogwheel rigidity, bradykinesia, and postural instability, all more consistent with PD.

Table 7: Causes of Enhanced Physiological Tremor

Stress, anxiety, fatigue, such as post-exertion
* Hypoglycemia, hyperthyroidism
* Drugs including beta-agonists, e.g., Salbutalmol
Selective serotonin reuptake inhibitors, tricyclics, neuroleptics
Decongestants e.g., pseudoephedrine
Amphetamines, dopamine agonists
Lithium, valproic acid
* Substance abuse—chronic alcohol use/withdrawal, excess caffeine, benzodiazepine withdrawal.

including thyrotoxicosis, hypoglycemia, fever and stress. It is also often induced by specific medications, toxins and substance abuse. Table 7 includes a complete list of causative agents.

Key Points

- Essential tremor (ET) is the most common movement disorder among older adults, with a reported prevalence of 4% of the population over 65 years of age.
- Postural tremor is the major feature of ET, while rest tremor predominates among individuals with Parkinson's disease, although there is greater overlap among older adults.
- Take a careful drug history (both prescribed and over-the-counter) and also enquire regarding caffeine/ethanol use.
- Ask patients with tremor about family history and also the effect of alcohol on tremor.
- Beta blockers (if not contraindicated) are first-line treatment for postural type tremor.

Treatment is aimed at the underlying cause of the postural tremor, including reducing or removing the offending medication. When this is not possible, low doses of Propranolol can be useful, especially for control during a specific event.

Parkinson's Disease

The complete treatment of this important disorder is beyond the scope of this article. Anticholinergics are relatively contraindicated for older adults because of the frequency of significant adverse effects, including delirium. The mainstay of treatment is levodopa/carbidopa (Sinemet). Dopamine agonists are less effective for older adults with tremor compared to younger persons. Amantadine (Symmetrel) occasionally lessens parkinsonian tremor.

Table 8 provides an overview for distinguishing tremor syndromes.

Miscellaneous Tremors

Cerebellar Type Tremors

There is no useful drug treatment for this disorder.

Psychogenic Tremor

Like other psychogenic disorders, the symptoms are highly variable at different times and tend to diminish when the patient's attention is distracted. It can be associated with a very bizarre gait disorder and treatment is directed towards the underlying psychiatric condition.

Surgical Treatment of Tremor

Unilateral thalamotomy can be effective for treating contralateral severe essential

Table 8: Distinguishing Tremor Syndrome

	Physiological tremor	Essential tremor	Parkinson's tremor
Frequency	10–12 Hz	4–12 Hz	4–7 Hz
Tremor type	Posture > kinetic	Posture > kinetic	Rest > posture
Character	Fine	Moderate amplitude	"Pill rolling"
Part affected	Hands	Hands, head, voice	UE > LE
Laterality	Bilateral	Bilateral	Initially unilateral
Accompanying features	None	None	Rigidity, bradykinesia, etc.
Effects of aging	Nonprogressive	Progressive	Progressive
Effects of alcohol	Little effect	Decreases tremor	Little effect
Effects of caffeine, stress, stimulants	Increases	Mild increase	Mild increase
Genetics	None	Autosomal dominant with variable penetrance	Important in approximately 20% of patients

Recommendation for Further Reading

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tremor that is refractory to medical management. Deep brain stimulation of the ventral intermediate thalamic nucleus is also effective for severe tremor in ET, and tends to have fewer complications than thalamotomy. Deep brain stimulation also has a role in the management of medically intractable severe Parkinson's disease symptoms, including tremor.

Conclusion

As our population ages, clinicians will be seeing more patients who have troublesome tremor. We need to be able to recognize the major tremor types, especially rest and postural tremor, and appreciate the additional effects of drugs/substance use. A focused history and physical examination can clarify the diagnosis and rationalize the management of tremor.

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