Treatment of Palatal Tremor

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Case 1

This 60-year-old right-handed woman was well apart from a history of treated hypothyroidism and hypertension. In April 2012, she presented to hospital with a left third nerve palsy. Investigations revealed a brainstem cavernoma which was initially treated conservatively. In March 2013, she presented with progressive neurological symptoms resulting from a further hemorrhage in the brainstem. She underwent resection of the cavernoma and postoperatively had diplopia secondary to a partial third nerve palsy, dysarthria, dysphagia, right-sided weakness, and ataxia. In October 2013, she developed prominent "shaking" of her right leg which interfered with standing and compromised ongoing rehabilitation therapy. On examination by me in January 2014, she had dysconjugate gaze with 30% restriction of elevation and 10% restriction of adduction of the left eye, and the left pupil was larger and slower to react than the right. There were no spontaneous movements of the eyes. She had a prominent scanning dysarthria, a questionable spastic catch and brisk reflexes but full power in the right limbs, dysmetria, and dysdiadochokinesia in all limbs, worse on the left side. She was wheelchair-bound and could not ambulate without considerable assistance. There was a 3–4 Hz rhythmical movement of the eyelids on light closure and a similar frequency, possibly synchronous, tremor of the soft palate. Since the onset of her symptoms, she had been unaware of involvement of the lids and palate and denied ear clicking. A similar frequency, somewhat irregular, tremulous movement (myorhythmia) was present in the right leg. At times, with complete relaxation, this movement would briefly subside. At other times, either during volitional movement or following activation, the amplitude of the leg tremor increased markedly. Standing and weight-bearing accentuated the leg tremor, further impairing her ability to stand without support. MRI in March 2013 showed a hemorrhagic lesion extending from the inferior left thalamus to the mid-pons with some extension to the right side of the brainstem (Fig. 41.1). At that time, no abnormalities were seen below the pons. Repeat MRI in September 2013 on FLAIR sequences showed a mixed hyper- and hypointensity lesion largely involving the medial right midbrain tegmentum. The inferior olives were now enlarged and hyperintense, the left more than the right (Fig. 41.2).

Treatment with trihexyphenidyl, gradually increasing to 2.5 mg TID, provided benefit that the patient and her husband rated at 75%, reducing the frequency of occurrence and severity of the leg tremor and allowing her greater independence in ambulation using bars in the home (e.g., no longer needing assistance from her husband to get from her bed to the bathroom at night). Examination showed improvement in the right leg tremor but no change in the palatal tremor. The addition of amantadine 100 mg TID provided mild further benefit without side effects. The response obtained from this medical therapy allowed her to return to an active physiotherapy program with overall further improvement in function.

Case 2

This 33-year-old previously healthy woman developed the sudden onset of a rhythmic but impersistent clicking noise in her right ear on her way home from the hospital having just delivered her first child. Within 1 month, the clicking became continuous. This interfered with her sleep and was associated with marked anxiety and depression. She was seen at another institution and given a diagnosis of "essential palatal tremor." MRI showed scattered areas of high signal intensities on T2 throughout the subcortical white matter with a frontal lobe predominance but normal brainstem including

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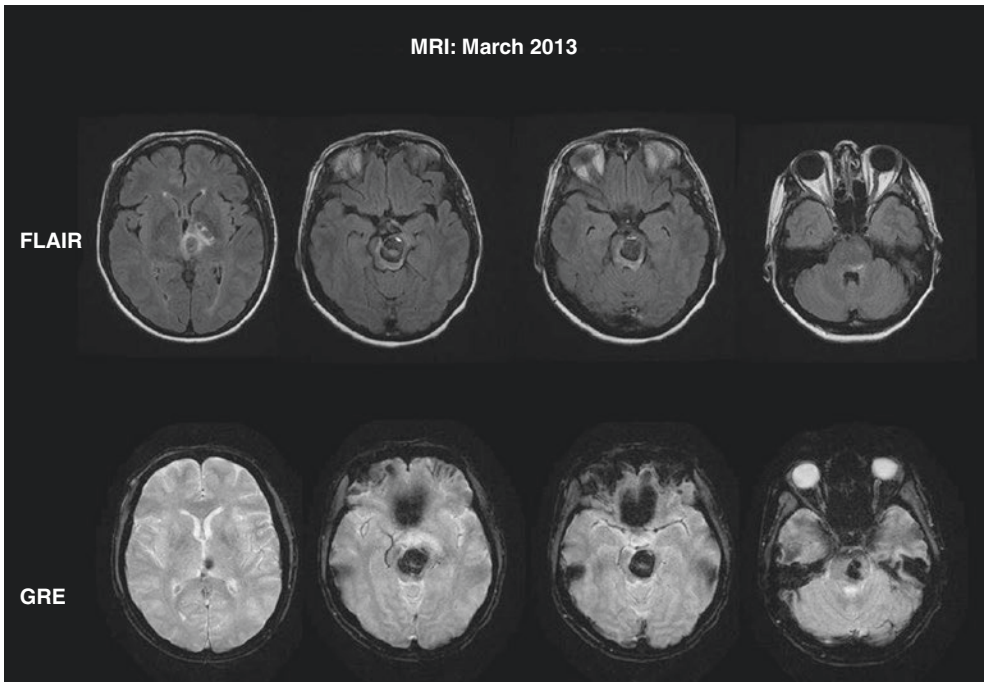

Fig. 41.1 FLAIR and GRE MRI scans in Case 1 from March 2013. Hemorrhage in cavernoma extending from the left thalamus to the mid pons

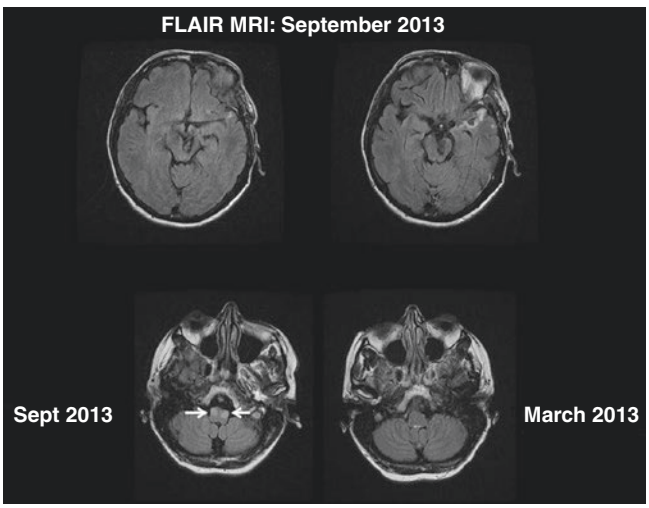

Fig. 41.2 FLAIR MRI scans in Case 1 from September 2013 showing partial resolution of the hemorrhage and the development of enlargement and hyperintensity in the inferior olives not present on the scan obtained 6 months earlier

volume and signal intensity of the inferior olives. She was given multiple drug trials including clonazepam and levetiracetam without benefit and received botulinum toxin injections to the soft palate every 3 months for 2 years with no benefit but occasional hoarseness of voice and nasal regurgitation of fluids.

She was seen by me 7 years after the onset of symptoms. She was anxious and tearful complaining about the persistent clicking as well tightness in the throat, lower face, and perinasal region. Clicking was audible when sitting close to her. The neurologic examination was normal apart from the soft palate which demonstrated a quite variable, at times rhythmical (2–3 Hz), movement which subsided completely on breath holding and with distraction maneuvers and at other times could be entrained to repetitive movements performed to command with the fingers. Assessment by a neuropsychiatrist diagnosed a major depressive disorder. Clonazepam was gradually discontinued and replaced by clomipramine. On follow-up, she noted that she did not hear the click when busy or occupied with something such as cooking and working around the house. However, it continued to bother her on attempting to sleep and sometimes awoke her from sleep, although since starting clomipramine she found her sleep had improved considerably and she was able to sleep 4 h without interruption.

Case 3

This patient was reported previously (see Kern & Lang in suggested readings). He was a 19-year-old man who had noticed bilateral ear clicking since age 7 which impacted his ability to concentrate. In early childhood he had middle ear atelectasis causing bilateral hearing impairment for which he underwent removal of a right ear cholesteatoma and placement of bilateral tympanostomy tubes. When he was seen by me, his neurologic examination was normal apart from mild left ear hearing impairment and a semi-rhythmic (≈2 Hz) palatal tremor associated with audible clicks. The frequency was quite variable and could be entrained or completely subsided with distraction.

We postulated that the palatial tremor was a learned behavior that developed in childhood because of his otolaryngological problems to help open the Eustachian tubes. We

demonstrated to him the effects of entrainment and distraction and taught him that he could do this purposefully. We asked him to practice controlling the movements, and within 1 week of routinely doing this at home using a mirror, he was able to obtain complete voluntary control including stopping the movements entirely for prolonged periods. At a 1-year follow-up visit, he showed maintenance of excellent control, only demonstrating the palatal movements when asked to reproduce them to command at various frequencies.

Discussion

Palatal tremor (PT), usually referred to as palatal myoclonus in the older literature, is subdivided into two general categories: "essential" PT (EPT) and secondary (or symptomatic) PT (SPT). SPT is typically caused by lesions involving the dentato-olivary pathway (Table 41.1) resulting in trans-synaptic hypertrophic degeneration of the inferior olivary nucleus evident on MRI (Case 1). As Case 1 demonstrates, in patients with acute causative brainstem lesions, the olivary changes typically develop after a variable latency following the initial insult. SPT involves the levator veli palatini muscle (the posterior soft palate) innervated by cranial nerves IX and X. The palatal movements of SPT show little change in frequency on examination, are generally not accompanied by ear clicks, and persist in sleep. SPT typically begins later in life (usually after age 40). Given the nature and location of the lesions / diseases causing SPT, these patients have a number of other neurological abnormalities including synchronous movements of other cranial muscles, especially the eyes, causing pendular nystagmus, as well as ataxia and other brainstem signs. Depending on the location of the lesion, patients occasionally have rhythmical movements of the limbs (as in Case 1), often referred to as myorhythmia (see Baizabal-Carvallo JF et al. and Ure RJ et al. in suggested readings). In contrast to the other neurological abnormalities, most patients are unaware of the palatal movements. They may complain of oscillopsia due to the abnormal eye movements.

In contrast to SPT, EPT begins at a much younger age (adolescence to early adult life) and presents with ear clicks that often can be heard by others. The ear clicks are typically the only symptom, but these can be associated with profound distress. The clicks typically originate from the sudden opening of the Eustachian tube through contraction of the tensor veli palatini (the anterior soft palate), innervated by cranial nerve V. The movement frequency is often noted to be variable and subsides in sleep. Apart from the palatal movements and ear clicks, and occasional similar movements seen in the tongue and anterior neck, these patients lack other neurological abnormalities, and neuroimaging is normal. We proposed an alternative designation of "isolated palatal tremor" (IPT) (see Zadikoff C et al. in suggested readings) to emphasize the isolated nature of the movements, without other neuro-

Table 41.1 Classification and subtypes of palatal tremor

Major category	Etiology	Subdivision/etiology	Comments
Isolated palatal tremor			
	Voluntary/special skill		Patient recognizes that they can cause the movement and clicks and can control the movements including changing the speed
	Functional	Learned behavior	Case 3
		Psychogenic	Case 2
	Tics		Usually occurs in setting of a known tic disorder. Patient will typically recognize the urge similar to their other tics
	Essential palatal tremor	No distraction, entrainment	Unclear whether such an entity exists
Symptomatic palatal tremor			
	Vascular disease		
	Trauma		
	Tumor		
	Multiple sclerosis		
	Degenerations	Hereditary – e.g., Alexander's disease, SCA20, POLG mutations, GM2 gangliosidosis	
		Sporadic – e.g., "idiopathic" progressive ataxia with palatal tremor (PAPT), progressive supranuclear palsy, associated with dystonia	
	Encephalitis	For example, Whipple's (palatal involvement is uncommon in Whipp le's in contrast to ocular, facial and masticatory movements)	
	Others	Cavernoma, AVM, H. zoster, neurosarcoidosis, steroid responsive (Hashimoto's) encephalopathy, brain abscess	Case 1

logical findings or imaging abnormalities, and to highlight that this is not a "primary" movement disorder similar to essential tremor or idiopathic dystonia. We suggested a number of possible underlying mechanisms including a psychogenic movement disorder (as in Case 2) and tics. A subsequent retrospective review of ten patients with IPT found that 70% had clinical features supportive of a diagnosis of a psychogenic movement disorder (i.e., distractibility, entrainability), two had tics, and one was diagnosed with EPT (see Stamelou M et al. in suggested readings). In proposing the category of IPT, we also emphasized the etiology of a voluntary or learned special skill (perhaps comparable to ear wiggling and voluntary nystagmus) causing isolated palatal tremor as sometimes seen in scuba divers and wind instrument players, probably developed to open the Eustachian tubes to normalize the pressure in the middle ears. In our report of Case 3, we argued that although the clinical features of distractibility and entrainability might be used to support a psychogenic etiology, the lack of underlying psychological factors, the development in the setting of clear otolaryngological pathology, and the voluntary control that the patient established by simple education and practice all favored the classification of a "functional movement disorder" secondary to a learned behavior. This may apply to many other patients with IPT given the common history of onset in the setting of past upper respiratory tract infections.

Management

The management of PT will obviously depend on the etiology and the complaints of the patient. As indicated, most patients with symptomatic PT are not aware of the palatal movements, and extra-palatal movements are generally not a major source of disability in contrast to their other accompanying neurological deficits. Case 1 represents an uncommon situation where palatal tremor was combined with myorhythmia in the right leg which responded to modest doses of trihexyphenidyl with a possible further improvement on amantadine. As with Holmes tremor, patients can also be given trials of levodopa, clonazepam, and other agents; however, there is little evidence to support the preferential selection of specific treatments in this disorder (see Chap. 45). Similarly, in patients complaining of oscillopsia, a variety of treatments can be used, but there is very little strong supportive evidence available on the treatment of nystagmus and none specifically related to the problem associated with SPT. Trials of an anticholinergic, gabapentin, memantine, 4-aminopyridine, clonazepam, or baclofen could be considered in patients bothered by this symptom (see Thurtell MJ in suggested readings).

The approach to management of isolated/essential PT is entirely different. Here, patients often complain bitterly of the consequences of the palatal tremor – i.e., the ear clicks. However, the fact that this disorder is probably functional or psychogenic in the majority of patients has only been recognized recently. As we have argued in our original publication of Case 3, these two terms (functional and psychogenic) are not necessarily interchangeable (they have been separated in Table 41.1), and this distinction will be important in the therapeutic approach. Our experience with Case 3 suggests that when patients can appreciate the potential for voluntarily altering the tremor, the patient education, teaching them to bring the tremor under complete voluntary control, is the optimal first-line therapy. I have no further experience with this approach so am unable to comment on its success or failure rates. In patients with the possibility of a psychogenic cause, evaluation and possible care by a psychiatrist is important, and this was clearly helpful in Case 2. It is also possible that these patients could be trained to control the PT as in Case 3 but recognition and management of the accompanying psychopathology will also be important.

A variety of treatments have been claimed beneficial in patients with "EPT"; however none of these treatments have been studied in a placebo-controlled fashion, and these reports largely preceded the recognition of the predominant psychogenic/functional cause raising the strong possibility that placebo responses accounted for the benefit reported. The commonest treatment reported in recent years is the injection of botulinum toxin into the tensor veli palatini muscle. Single cases and small case series have claimed benefit to both the palatal movements and the accompanying ear clicks. As emphasized by Slengerik-Hansen and Ovesen in a recent systematic review of the literature involving 51 patients (see suggested readings), the studies available "form an extremely low evidence level with several sources of bias." Once again, a critical problem with these studies is the failure to recognize the functional/psychogenic etiology (not mentioned by Slengerik-Hansen and Ovesen) and the lack of placebo-controlled trials. In general, these injections have been relatively well-tolerated although complications have included self-limited dysphagia, trans-nasal regurgitation, changes in speech (e.g., hyper-nasality), and aural fullness, and rarely temporary nasogastric feeding has been required due to the severity of the dysphagia. Improvement has been reported in the majority of patients described, and remarkably, in the majority of these, the problem "resolved" completely, and in many, this effect lasted for the entire follow-up of months to 1–2 years, further raising the concern about a possible placebo response (although Slengerik-Hansen and Ovesen proposed several other poorly substantiated mechanisms). At this time, there is no consensus of opinion on how to best manage these patients. In those resistant to either simple education and retraining or management of underlying, possibly contributory, psychiatric problems who remain extremely distracted and disabled by the ear clicks, a cautious trial of botulinum toxin could be considered. In view of the reported

success of using very low doses of botulinum toxin combined with strong suggestion in patients with functional/psychogenic dystonia (see Edwards MJ et al. in suggested readings), this approach should also be considered in patients receiving botulinum toxin for IPT. However, in contrast to the care received by Case 2, this treatment should be discontinued if the first one or two injections fail to provide clear benefit.

Suggested Reading

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