Movement Disorders
CLINICAL PRACTICE

CASE REPORT

Essential Palatal Tremor Synchronization: A Study by Video Record Numerical Analysis

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Clinical Context

A 12-year-old girl presented with a 2-year history of rhythmic ear clicks. She was born 7 weeks premature with caesarean without fetal distress and had a normal psychomotor development. A strabismus was corrected by surgery.

The clicks started concurrently with an acute infectious sinusitis. These involuntary clicks were not bothersome and stopped during sleep. They were present every day with a fluctuating intensity. Free intervals shorter than 2 days may rarely occur. She had no particular tricks to control the clicks, and no provoking factors were identified. Examination revealed isolated continuous rhythmic bilateral and symmetrical brisk movements of the soft palate (see Video 1). Brain MRI was normal with no hypertrophy of the inferior olive. Because the movements of the soft palate seemed quite irregular, she was referred to our neurophysiology department to determine precisely the palatal tremor (PT) frequency and to perform frequency entrainment trials in order to examine the psychogenic hypothesis.

Video Recording

Surface electromyography performed over the digastric muscles displayed no abnormal activity. A standard video-audio camera was used to record the open-mouth uvula and soft-palate movement. Duration of records was set at 30 seconds, repeated twice, with a pause between each sequence, drinking water if needed. During entrainment trials, the patient was asked to match her wrist movement with the target rate corresponding to a given metronome frequency. Tone frequencies were consecutively set at 1, 2, and 2.66 Hz. Frequency of the finger tapping was monitored by using the sound produced by a metallic ring attached to the middle finger at each beating on the table.

Method of Analysis

The video record shows a repetitive and rhythmic movement of the soft palate associated with the auditory click.[1] Assessment of limb tremor frequency using a specific video analysis program has been previously reported.[2] A more detailed analysis of the movement of the uvula was developed here using software devoted to the simultaneous study of the sound and the image. We selected "Adobe Soundbooth CS3" to observe a frame after frame record. It was then possible to record the time readable on the time track by selecting a reproducible position of the uvula, such as the upper one (see Video 1). One obtains a time interval table of the uvula up position. A frequency count was done selecting bin size (0.1 seconds) and number, taking into account the number of up uvula collected. Two binning's results, for each sequence, were added to analyze the time interval distribution using Gaussian fit, as shown in Figure 1.

Audible ear clicking was recorded on the videotape (Fig. 1C). Because soundtrack analysis revealed fewer amounts of clicks than those observed on the video image record, they were not collected for analysis.

Results

Fitting curves are shown in Figure 1 and characteristic fitting values in Table 1.

Spontaneously, PT displayed a low main frequency below 2 Hz with a high dispersion of time intervals (standard deviation [SD]: 0.48–0.57 seconds). The patient performed effortlessly the rhythmic voluntary finger tapping at each frequency requested for entrainment trials. In the three consecutive competitive conditions (1, 2, and 2.66 Hz), PT main frequency shifted at approximately 2.8 Hz, with a significant reduction of the dispersion of time intervals (SD, 0.34–0.37), compared to the spontaneous condition.

Discussion

We propose a simple, noninvasive novel method based on video/audio recordings to analyze soft-palate abnormal movements and study their changes in the frequency distribution under modifying tasks.

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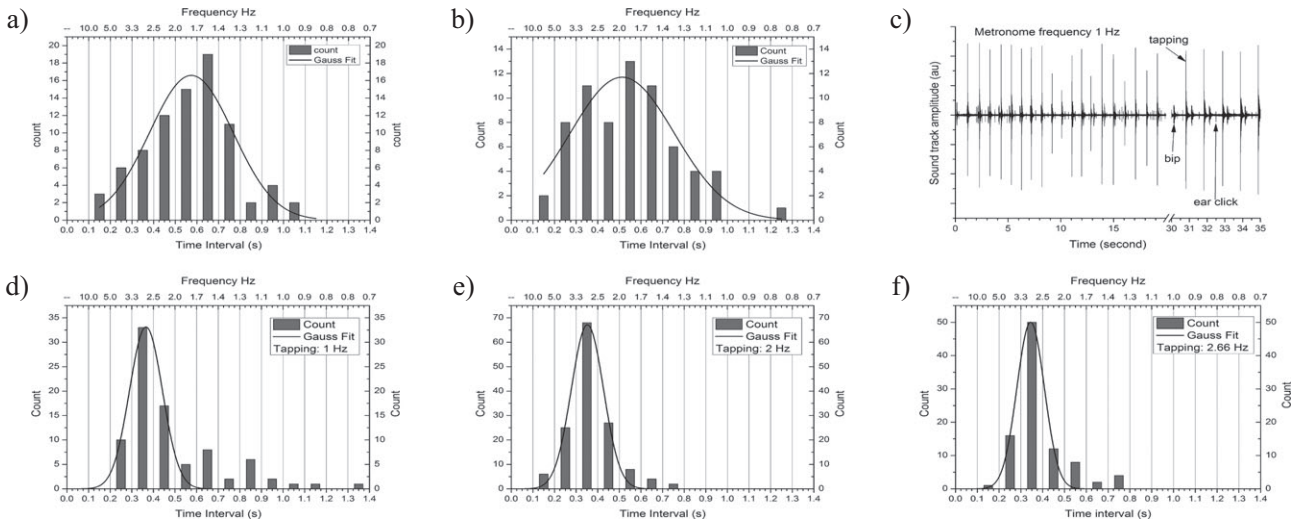

Figure 1 Time interval counts and Gaussian fitting obtained (A) before and (B) after entrainment trial and (C) soundtrack showing metronome bip, hand tapping, and ear click. Entrainment trials performed at (D) 1, (E) 2, and (F) 2.66 Hz.

TABLE 1 Characteristic time interval distribution fitting values

Trial	Main Time Interval (s)	Time Interval SD (s)	Main Frequency (Hz)
Before entrainment trial	0.574	0.48	1.74
Trial at 1 Hz	0.366	0.15	2.73
Trial at 2 Hz	0.353	0.15	2.83
Trial at 2.66 Hz	0.345	0.13	2.90
After entrainment trial	0.514	0.57	1.95

Psychogenic palatal tremor may be under-recognized[3] and can occur in children.[4] The frequency entrainment sign is a core positive feature supporting the diagnosis of psychogenic tremor[5] and was previously used in the setting of psychogenic PT.[6] In some patients, this sign may be difficult to assess on clinical grounds only. Here, in this 12-year-old girl, the negative entrainment test strongly argues against a psychogenic PT. On contrary, during competitive rhythmic task, the PT displays a reproducible higher synchronization pattern approximately 3 Hz that seems independent on the frequency of the voluntary task. This may reflect the implication of a central generator activity, released from a voluntary control by distraction. This pure near-3-Hz frequency is in keeping with hypotheses about the central generator location in essential palatal tremor partly based on functional MRI studies[7,8] that may include the inferior olive through the dentato-rubro-olivary pathway or brainstem oscillatory nuclei.[9,10]

Author Roles

(1) Research Project: A. Conception, B. Organization, C. Execution; (2) Statistical Analysis: A. Design, B. Execution, C. Review and Critique; (3) Manuscript: A. Writing of the First Draft, B. Review and Critique.

A.P.L.: 1A, 1C, 2A, 2B, 3A, 3B

H.E.: 2C, 3B

E.R.: 1A, 2C, 3B

M.V.: 2C, 3B

E.A.: 1A, 1B, 1C, 2C, 3A, 3B

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Supporting Information

A video accompanying this article is available in the supporting information here.

Video 1. Serial video sequences obtained before, during, and after entrainment are displayed in the order of the recording sessions and followed by video record numerical analysis procedure demonstration.

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