Case/ Reference	Sex	Age at onset (in years)	Trigger	Provoking factors	Clicks/ Muscles involved	Frequency/ Regularity	Presence in Sleep	Distracti- bility/ Entrain- ability	Voluntary control/ "tricks"	Course/ Response to treatment	Psychiatric features/ other conditions
Boeck 1867	М	Childhood	N/A	Swallowing	Clicks in the left ear and synchronous contractions of the soft palate and the larynx	Synchronous with the pulse, however, ceases sometimes for 30 – 60 seconds	Present, sometimes awakens patient	N/A	N/A	Sometimes spontaneously disappears for hours or days; disappeared after faradisation (electrical current)	Reduced hearing in the contra lateral ear, red and swollen mucosa in the posterior nasal cavity, swelling of the left tube and deposition of mucous, dilated, hyperemic vein on the lip of the left tube
Politzer 1870	F	12	N/A	N/A	Bilateral ear clicks	Left ear: 15- 27/min; Right ear: 20- 32/min	Present	N/A	Disappeared briefly when saying "a, e, i" and when pushing the roof of the palate up with a finger	Disappeared after faradisation	Enlarged tonsils, chronic cold, anemia
Baker 1885	F	13	N/A	N/A	Clicks and contractions of the left tensor veli palatini	Frequency N/A; rhythmic	Present	N/A	Voluntary control on both starting and stopping the sounds (patient could not explain how) only after various treatments; no effect by talking, chewing, swallowing or changes in body position	Initially very bothersome; disappeared after various treatments (tonsillectomy, Politzer's "Luft- douche" twice a week, and iron tablets)	N/A
Shadle 1889	F	N/A (young	N/A	N/A	Clicks and choreic	Frequency N/A;	N/A	N/A	N/A	Disappeared after surgery	Chronic hypertrophy of the lower and middle

(C te:	Case 4 in xt)		lady)			movements of the soft palate	rhythmic				(adenoidectomy)	nasal conchae pressing on the nasal septum and causing stenosis of the middle nasal duct
Vi 19	ali 105	М	40	Bad cold	Swallowing or jaw movements do not alter sounds	Clicks left > right, tone equals the 5' C	88/min; synchronous with the pulse	Present	N/A	No voluntary control, however, sounds were suppressed or even ceased by pressing down the tongue or by lifting up the soft palate, by catheterizing the tube or by pressing a finger into the external auditory meatus	Diminished after catheterization of the nasal tube, application of silver nitrate (2%); subsequently the sounds changed over the following 2-3 months both in intensity and in quality, then only occurred after mental or physical exercise, and finally disappeared altogether; the patient was, however, left with a subjective tinnitus and bell- like sound, precipitated by stress and alcohol	Otitis media, chronic cold
K. 19	lien 918	F	13	N/A	N/A	Clicks and bilateral palatal movements	N/A	Sometimes present	N/A	Patient had voluntary control but could not describe how she elicited the movements	Ameliorated by psychological treatment (encourage patient to get rid of the habit of ear clicking)	Swelling of the nasal conchae

Bredlau 1938	M	9	Purulent ear infection	N/A	Clicking noise in right ear and occasional synchronous contractions of the palate on that side	100/min	N/A	N/A	N/A	Condition persisted after ear infection was cured	N/A
Niederwiese r 1938	F	11	Symptoms began during a math lesson at school	N/A	Clicks in both ears and contractions of the soft palate	N/A; rhythmic	Present	Distractible ; disappears for some time and then recurs;	Movements and sounds less obvious or even disappear when gagging, eating or speaking	Condition disappeared after "suggestive" therapy with tinctura amara and a single faradisation	Strong "neuropathic" traits; two days after the palatal movements stopped, developed a tremor of the right big toe that was responsive to verbal suggestion Adenoids
Jennings 1938	N/A	13	N/A	N/A	Clicks in both ears with synchronous contraction of the palate	130/min	N/A	N/A	N/A	Present ever since the child could remember	N/A
Davis and Kirchick 1947	М	N/A	Symptoms began after his ears had been plugged by forceful blowing of the nose	N/A	Ear clicks and contractions of the muscles around the tube	N/A	N/A	N/A	Contractions and clicks could be suppressed by holding his nose and plugging his ear with his finger	Stable, only intermittently relieved by treatment; no response to Novocain or prostigmine into the tubopalatal muscles;curare, injected into the tubal muscles, caused slowing of the muscles and the tinnitus for about 1 week	N/A
McGriff 1947	М	34	Clicks developed after a gun explosion	N/A	Ear clicks and synchronous contraction of the	N/A	N/A	N/A	All local treatments failed; hypnosis	N/A	N/A

					tubopalatal muscles				was successfully induced but had no effect on the clicks and movements		
Schwartz 1948	М	29	N/A	N/A	Bilateral clicking; rhythmic contraction of temporalis and masseter with gritting of teeth; rhythmic contraction of orbicularis oculi when eyes are shut; rhythmic movements of palate and tongue when mouth is open	108 vs. 78/min vs. 87/sec; rhythmic	Conflicting reports; did not interfere with sleep "unless an ear was on the pillow"; But also state that it disappears during sleep	N/A	N/A	Intermittent for 3 years lasting days to weeks; only became bothersome 3 months prior to admission; "cured" post suggestion that copper pennies on mastoids would make the clicking cease	Suffered great deal of distress from headache; seen by psychiatrist who says the "clicking is made voluntarily by the patientthe basis is simply a desire to leave his job of coal mining because of the fear which is constantly presentand can only be released if ill and not fit for the job. He has feigned disability by making this clicking sound and complaining of headache"
Pearson and Barnes 1948 Case 1	М	N/A	Clicks developed after a gun explosion	N/A	Objective tinnitus – contraction of TVP and soft palate	N/A	N/A	N/A	N/A	Successfully treated with hypnosis; still absent at 6 week follow-up	"personality evaluation revealed a mild disorder with definite tendency towards tic and spasm"
Pearson and Barnes 1948 Case 2	М	N/A	N/A	N/A	"Objective tinnitus"	N/A	N/A	N/A	N/A	Successfully treated with hypnosis	N/A
Stern 1949	М	N/A (likely in his 20ies	Head trauma	Opening his mouth increased the clicking; pressure on his eyeballs or carotids	Clicks and bilateral myoclonic movements of the soft palate, uvula, pharynx and	120-140/min	N/A	N/A	Movements barely perceptible for 5-10 seconds when the mouth is	Clicking sound started three weeks after the trauma; no response to phenobarbital, phenytoin, and	None

				produced momentary increase in rate, tongue depressor had no effect	base of tongue				open; swallowing and coughing cut down the latent period, however, clicking always present	prostigmine very little change at 4 year follow-up	
Alfaro 1950 Case 1	M	20	N/A	N/A	Ear clicks and dimpling on each side of the palate when the mouth was stretched open; when relaxed, a definite pull on the uvula occurred	80-90/min; irregular	N/A	N/A	N/A	Stable; no treatment tried	Herpes zoster at the age of 8
Alfaro 1950 Case 2	М	60	Several months after dental work	N/A	Ear click on the left, contraction of tubal muscles on both sides, much more pronounced on the left, synchronous dimpling on both sides	106/min; irregular	N/A	N/A	N/A	Stable; no effect of tetracaine and procaine; hypnosis could not be induced	Recurring pain over the left antrum
Alfaro 1950 Case 3	М	18	Gun explosion	N/A	Bilateral contractions of tubal muscles, slight synchronous	140/min	N/A	N/A	At the beginning, patient could control his ticking sound that	Unresponsive to topical application of tetracaine	Radiation therapy for lymphoid tissue in the nasopharynx

						elevation of				then became		
						the soft palate				continuous		
						on both sides				and		
										uncontrollab		
										le; ticking		
										may stop in		
										1 ear for as		
										much as 1		
										hour at a		
										time without		
										stopping in		
										the other		
ſ	Engsrom	F	36	3 months	N/A	Murmur in	N/A	N/A	N/A	Could	Sound grew	N/A
	and Graf			after the		left ear				disappear by	softer after a	
	1952			patient's						digital	few months and	
				4^{th}						pressure	then disappeared	
				delivery						near the		
				-						occipital		
										artery		
										behind the		
										mastoid		
										process		
ſ	Freund	М	22	9 years	N/A	Irregular	116-150/min;	N/A	N/A	Frequency	Unchanged after	N/A
	1956			earlier had		tinnitus from	irregular			increased	1 year	
				bell's		right >left,	0			while	•	
				palsy on		synchronous				exhaling,		
				the right;		with soft				decreased		
				clicking		palate				with		
				sound		-				inhalation;		
				became						could stop it		
				apparent						by holding		
				soon after						breath or		
										breathing		
										rapidly and		
										shallowly		
ſ	Bogner	F	30	N/A	N/A	Left-sided	120-240/min	Absent	N/A	No effect of	Cured after eight	"Neurasthenic" young
	1956					clicks and				head posture	days of therapy	woman
						palatal				or jaw	with buscopan,	
						movements				movements	megaphen, and	
											short wave	
											irradiation and	

										remained absort	
										for the 18 month	
										follow up period	
	Г	5	II' d	NT/A		05.110/ .	A1			Tonow-up period	(CT 7 4 4' ' ''
Götze	г	5	Hit on the	IN/A	Clicks and	95-110/min	Absent	N/A	Patient	Stable;	vegetative neurosis",
1957			neck at		synchronous				admits under	disappears under	physically abused by
Case 1			age 5		movements of				superficial	deep anesthesia,	her tather as a child,
			(crunchin		the soft				anesthesia	no effect of	bilateral hearing
			g noise in		palate,				with evipan	pantocain and	impairment
			both ears)		sometimes of				that she	Novocain, or	
			and fall on		the base of				elicits the	atropine;	
			the neck		the tongue				noise	purging of the	
			at age 16		and larynx				voluntarily	tubes did not	
			(worsenin						and feels an	cause any	
			g of						urge to do	benefit; largactil	
			sounds)						so; she can	stops sounds and	
									stop the	movements for	
									sound for	several days	
									minutes;	(high doses),	
									sounds and	hypnosis could	
									movements	not be induced	
									disappear		
									under deep		
									anesthesia		
Cötza	М	58	N/A	N/A	Clicks and	30-60/min	N/A	N/A	N/A	Stable	Hearing impairment
1057					synchronous					(disappears.	
1957					movements of					sometimes for	
Case 2					the soft palate					several days	
					(click and					when the natient	
					contractions					has a cold)	
					time-locked					Purging of the	
					but clicks do					tubes stopped	
					not occur with					sounds for half a	
					every					day	
					contraction)					uay	
	м	11	N/A	N/A	Clicks in the	61/min	Absort	N/A	N/A	Stable at 1 year	Frequent tonsillites
Götze	IVI	11	IN/A	1N/A	right corr	04/11111	Absent	1N/A	IN/A	follow up	Frequent tonsmites
1957					ingin ear;					Sounds ston	
Case 3					small					Sounds stop	
					bilateral,					during local	
					irregular and					anestnesia with	
					asymmetric					Novocain	
		1			movements of		1				

Götze 1957 Case 4	F	14	N/A	N/A	the soft palate that turn into large contractions with synchronous clicks as soon as the attention of the patient is focused on the sounds Bilateral clicks (right >left), smaller fast and largerer slow	60-70/min (small contraction), 10-15/min (large	Absent	N/A	Swallowing and voluntary induction of movements	Stable at 1-year follow-up No effect of sevenal, belloid, bromide,	Hypopara-thyroidism
					palatal movements	contraction)				largactil, and local pantocain and novocain treatment; patient not suited for hypnosis	
Götze 1957 Case 5	М	9	N/A	N/A	Clicks present only on the left;small, low- amplitude movements of the soft palate and larger movements synchronous with ear clicks	84/min	Absent	N/A	Voluntary induction of sounds and movements	Initially constantly present; cessation of EPT five days after tonsillectomy, since then only present when elicited voluntarily	"Neurotic child", ear infection with perforation of the right ear drum
Schubert and Neuss 1959 Case 1	М	27	Sudden shock (was pushed into	N/A	Clicks and parallel innervation of the soft palate and the uvula	N/A	N/A	N/A	Could be provoked voluntarily	Sounds disappeared spontaneously but can since then be	N/A

			water)							provoked voluntarily	
Schubert and Neuss 1959 Case 2	F	19	Stress	N/A	Clicks and contractions of the soft palate	20-40/min	N/A	N/A	N/A	Sounds disappear when the patient relaxes for up to two weeks (vacation); clicking started again when she returned to work; no effect of sedatives	Stressful job, no neurological or psychiatric condition
Pulec and Simonton 1961 Case 1	F	22	N/A	N/A	Clicks in both ears synchronous with falling phase of palatal clonus	N/A	N/A	N/A	Interrupted by swallowing and talking refused hypnosis	2 year history in the left ear, 1 year in the right ear - intermittent; also had pain between throat and ears	Mastoidectomy at age 6, tonsillectomy and adenoidectomy; Asian "flu" 2 years prior to onset of clicks; seemed to "enjoy the attention" in the hospital and doctors began to suspect hysteria
Pulec and Simonton 1961 Case 2	М	40	N/A	N/A	Left side click synchronous with palatal movement	N/A; irregular	N/A	N/A	N/A	2 year history; not bothered by click so no further follow- up	Generalized tonic clonic seizures twice yearly
Heller 1962 Case 1	F	39	Appeared within 24 hours of whiplash injury	N/A	Ear clicks synchronous with movements of the soft palate	N/A	N/A	N/A	Flexion of neck reduced noise for temporary period as did rotation to left and right	Did not respond to anesthetic of spheno palatine ganglia; persisted at 1 year follow-up	N/A
Heller 1962 Case 2	F	17	N/A	Clicks were louder when she had a cold	Right ear clicks	80/min	N/A	N/A	Talking, swallowing and other pharyngeal activities	N/A	N/A

									stopped the sound		
Schenck 1965 Case 4	F	25	N/A	N/A	Clicks and rhythmic contractions of the soft palate	120/min	N/A	N/A	N/A	Constant clicking and palatal movements for 6 years, then disappeared spontaneously	Syphilis at age 22 years, followed by lid twitching, vertigo, sudden pain in the extremities, neck and face, weight loss, general fatigue, stopped working, not on any benefits, developed feeling of being "poisoned," does not leave the house, irritable
Hughes 1965	М	44	Upper respirator y tract infection followed by pain in the right ear; 3 days later developed clicking in the right ear	N/A	Clicks of right ear and less frequently left ear	130/min	N/A	N/A	Could be stopped by valsalva or pushing the tongue down with a tongue blade	The patient was extremely distressed due to clicks and threatened suicide; psychiatric intervention helped anxiety and decreased distress over clicking	History of depression, anxiety, suicide attempt
MacKinnon 1968 Case 1 (Case 6 in text)	F	24	severe cold	Intensity increased with increasing altitude (going up in a lift or an airplane) and opposite applied when coming down	Bilateral, synchronous ear clicks; right >left; single click in left ear; double click in right ear; noise sometimes stopped spontaneously in one ear and	126/min, but varied between 40- 160	N/A	N/A	Interrupted by valsalva, swallowing, opening mouth widely, deep inspiration	11 year duration; treated with short course of central depressants and tranquilizers which had no effect; then lost to follow-up	N/A

					continued in other						
Leventon and Floru 1968 Case 1	М	20	N/A	N/A	Clicking; not synchronous with pulse	N/A; rhythmic	N/A	N/A	Could be stopped temporarily by wide opening of the mouth and could change character and become bitonal with Valsalva	7 years without response to "treatments"; did not attempt further treatment because of fear it would interfere with psychiatric condition	Diagnosed with schizophrenia with a paranoid pattern
Leventon and Floru 1968 Case 2	М	62	Onset of tinnitus coincided with a severe traumatic experienc e (sudden death of several members of his family)	N/A	Clicking sound in left ear	N/A; rhythmic	N/A	N/A	Could be stopped voluntarily but reappeared spontaneousl y shortly thereafter	No follow-up provided regarding objective tinnitus; remained under psychiatric care	Psychiatric work up revealed depression due to sudden death of family members
Leventon and Floru 1968 Case 3	F	37	N/A	N/A	Noise heard in left nostril and left maxillary area; heard with stethoscope over left maxilla but not over ear or mastoid	N/A; rhythmic	N/A	N/A	N/A	Had a psychiatric work up and was diagnosed with conversion reaction; no further follow- up provided	Multiple somatizations regarding genital and urological systems
Leventon and Floru 1968	М	18	N/A	N/A	Bilateral clicking; not synchronous	N/A	N/A	N/A	Stopped when patient opened	Underwent psychiatric work up and was	Psychiatric exam revealed that patient had severe conflict with

Case 4					with pulse				mouth widely, but was present on slight opening	advised to undergo psychiatric therapy	father and this represented a "neurotic reaction as a flight into disease"
Leventon and Floru 1968 Case 5	F	19	Onset coincided with father's death	N/A	Clicking noise not synchronous with pulse; palatal myoclonus synchronous with ear clicks	N/A	N/A	N/A	N/A	Underwent psychiatric work up and was advised to undergo psychiatric therapy	Father had facial tic; psychiatric exam revealed anxiety neurosis with conversion symptoms
Cancura 1969 Case 1	F	27	N/A	N/A	Intermittent clicks and palatal movements	N/A	N/A	N/A	Voluntary control present	N/A	N/A
Cancura 1969 Case 2	М	32	N/A	N/A	Intermittent right-sided clicks and palatal movements	N/A	N/A	N/A	Good response to valium	N/A	"Other neurological problems"
Samant et al 1972 Case 1	М	20	Upper respirator y tract infection; anxiety; emotional crisis due to poor performan ce on exam preceding the onset of tinnitus	Anxiety	Bilateral ear clicks; soft palate, posterior pharyngeal wall movements	90 – 110/min	Absent	N/A	Ceased when held breath in deep inspiration or with valsalva	3 month duration; did not respond to tranquilizers or polyvitamins	Had emotional crisis immediately preceding onset of tinnitus
Samant et al 1972 Case 2	M	23	Subjective tinnitus and few episodes	N/A	Myoclonus of soft palate	N/A	Absent	N/A	Ceased with breath holding and valsalva	After 1 month on Stemetil ear clicks improved but 4 months	N/A

		-									
			of dizzy spells following an acute attack of influenza and URI							later tinnitus was even louder; improved with tranquilizers and polyvitamins	
Gupta et al 1972 (Case 5 in text)	F	28	N/A	N/A	Clicks and contractions of the muscles of the soft palate and the lateral pharyngeal wall	N/A; rhythmic	Absent	Not distractible by mental calculations	Clicks could be inhibited voluntarily but not sustained for long; valsalva maneuver stopped sounds and movements	Stable at 9- month follow-up	N/A
Kwee and Struben 1972 Case 1	F	28	Immediate ly following syringing the ear	N/A	Clicks and palatal myoclonus, twitches of the tongue, clonus of the floor of the mouth, and slight movements of the vocal cords	50-60/min	N/A	N/A	Sound but not muscle contractions disappeared when pressing a finger on the right half of the soft palate	Disappeared after middle ear aeration	Head trauma two years prior to onset of the clicks
Kwee and Struben 1972 Case 2	F	24	Started after serious cold of several months duration	N/A	Clicking and synchronous simultaneous contraction of the tensor veli palatini and the levator veli palatini	70/min; irregular	N/A	N/A	Sound but not muscle contractions disappeared when pressing a finger on the soft palate	Disappeared after middle ear aeration	Paresthesias, and reflex difference in the arms, "suggestive of multiple sclerosis"
Ritter 1973	М	30	N/A	N/A	Bilateral clicking sounds and	140/min; rythmic		N/A	N/A	Ameliorated after tubes; disappeared	N/A

					palatal					after local	
Magnussen et al 1977	M	30	3 years prior to onset fell from a pylon following an electric shock; there was no loss of conscious- ness	N/A	Ear clicks and palatal myoclonus	180/min	Yes	N/A	N/A	Tried multiple medications without effect and then tried 5- HTP in combination with carbidopa and 3 days later the myoclonus disappeared; maintained response at 2 month follow-up	None
Jacobs et al 1981 Case 1	М	19	Blunt blow to the left temple	Turning his head down and to the left increased intensity of the clicking and myoclonus	Clicking and vigorous palatopharyng eal myoclonus, submental and pharyngeal muscles "bobbed" synchronousl y with the palate; synchronous lip twitching	180-240/min	Absent	N/A	Prolonged phonation, swallowing, inspiration, turning his head down and to the right, and forced neck flexion reduced movements	Unchanged over 18 months	None
Jacobs et al 1981 Case 2 (Case 7 in text)	F	7	Recurrent tonsillitis and tonsillec- tomy	N/A	Clicks and gross rhythmic myoclonus of palatopharyng eal and submentalis muscles, trachea, and lips, synchronous	180/min	Present	N/A	Induces palatal myoclonus and clicks volitionally after the involuntary movements have stopped by "concentrati	Clicks gradually improved over 9 months and then ceased altogether 3 months later, did not recur during the 15-year follow-up (except for voluntary palatal	Clicks started 18 months after high fevers associated with recurrent tonsillitis and 12 months after general anesthesia for tonsillectomy

	1	1									
					with palatal				ng on her	tremor)	
					beat				throat"		
Litman and	Μ	6	None	N/A	Bilateral	60-70/min;	N/A	N/A	N/A	Present for 4-6	N/A
Hausman			known		clicks; soft	rhythmic				months;	
1982					palate					resolved	
					contraction					spontaneously 4	
					synchronous					months after	
					with clicking					first	
					in his ears					examination	
Fitzgerald	М	36	Suffered	Chain saw,	Left ear	128/min;	N/A	N/A	Could stop	Treated with	N/A
1984			an	loud noise, or	clicks;	rhythmic			ear clicks	diazepam with	
			explosive	emotional	movement of				and eye	no change in	
			injury to	stress could	both sides of				blinks	tinnitus, hearing	
			left side of	make it worse	soft palate				momentarily	in left ear	
			head		synchronous				by opening	gradually	
			while on		with ear				his mouth	returned; 4	
			military		clicks;				widely	months later	
			duty; 1		synchronous					switched to	
			day later		with eye					dilantin and	
			had left		blinks					phenobarbital	
			sided							(Pb); 6 days	
			hearing							later clicks	
			loss and							decreased to	
			clicking							40/min; when	
			noise in							taken off meds,	
			left ear							they increased to	
										152 /min;	
										returned to	
										dilantin and Pb	
										and tinnitus and	
										myoclonus	
										slowly	
										decreased in	
										frequency over	
										10 weeks; lost	
										to follow-up	
Tanaka et al	Μ	6	N/A	N/A	Ear clicks	120-180/min	No	N/A	Volitional	Did not respond	Mild neurological
1984					synchronous				deep	to a number of	findings: everted
					with soft				breathing or	sedatives	position of right foot,
					palate				painful		incoordination of left
					bilaterally and				stimuli to the		leg, slanting of head to

					ar 11				onol m		the might
					symmetrically				including 41		the right
					pulled up and				including the		
					баск				palate,		
									stopped his		
									palatal		
	_								myoclonus		
Siegel	F	4	At age 4,	Emotional	Click in left	160/min	N/A	N/A	Some	Presented at age	N/A
1987			child	stress	ear; bilateral		"slept with		voluntary	12 to dentist for	
			believed		undulating		left hand		control over	routine dental	
			bug flew		soft palate		over ear"		amplitude	care, at which	
			in ear, but		with				but not	time the patient	
			no foreign						frequency	mentioned ear	
			body was							clicks and so	
			found; at							referred to	
			2 years,							neurologist;	
			had high							bilateral second	
			fever with							division	
			febrile							trigeminal	
			seizure; at							blocks were	
			3, had							suggested; this	
			tonsillitis							decreased	
			and then							amplitude of	
			tonsillec-							myoclonus and	
			tomy:							made tinnitus	
			soon after							inaudible to	
			that							examiner but	
			nalatal							effect only	
			myoclonu							lasted 45	
			s started							minutes: no	
			s started							further tests or	
										turiner tests of	
										ureaument were	
Corbin and	Б	22	NI/A	Only	Ear aliak	120/min	NI/A	N/A	N/A	2 year follow	N/A
Williams	Г	32	1N/A	onnoonod	Edi Click	120/11111	IN/A	1N/A	IN/A	∠ year tonow-	1N/ <i>F</i> A
winnams				appeared	synchronous					up; no modioations	
1987				when head	with					medications	
				was tilted to	contraction of					tried; stable	
				left or right;	palate and						
				intensity	pharynx, only						
				varied from	present when						
				day to day;	head was held						
				could not be	in 45 degree						

East and Hazell 1987	N/A	74	N/A	heard during ear or throat infections N/A	lateral flexion (left or right) Rapid clicks right ear	N/A	N/A	N/A	N/A	3.5 year duration; tinnitus was	N/A
Case 2										controlled after 2 months of using tinnitus masking device; stopped masking at 3 months and still symptom free 2 months later	
East and Hazell 1987 Case 3	N/A	29	N/A	N/A	Clicking left ear with fluttering sensation	150/min	N/A	N/A	N/A	3 month duration; immediate slowing of clicks with tinnitus masking device; symptom free at 6 months	N/A
East and Hazell 1987 Case 4	N/A	9	N/A	N/A	Bilateral clicking in ears	>150/min	N/A	N/A	N/A	4 year duration; immediate response to tinnitus masking device; symptom free at 5 years	N/A
East and Hazell 1987 Case 6	N/A	70	N/A	N/A	Rapid ear clicks in left ear	N/A	N/A	N/A	N/A	10 year duration non compliant with tinnitus masking device; lost to follow-up	N/A
East and Hazell 1987 Case 7	N/A	16	N/A	N/A	Bilateral clicks; palatal myoclonus left >right	70/min	N/A	N/A	N/A	4 year duration; symptom free after 4 weeks of using tinnitus masking device	N/A

East and Hazell 1987 Case 10	N/A	36	N/A	N/A	Clicks in left ear; high pitched tinnitus	N/A	N/A	N/A	"partial voluntary control"	2.5 year duration; no effect of tinnitus masking device after 4 months	N/A
East and Hazell 1987 Case 11	N/A	8	N/A	N/A	Bilateral ear clicks	>100/min	N/A	N/A	N/A	5 year duration; initially responded to tinnitus masking device (decreased frequency of clicks) at 3 months but then uncontrolled after 18 months	N/A
East and Hzaell 1987 Case 12	N/A	45	N/A	N/A	Clicks in right ear	80/min; irregular	N/A	N/A	N/A	6 month duration; rate slowed after 6 weeks of using tinnitus masking device	N/A
Roche and Perkin 1987	М	52	No	Only occurred with neck flexed anteriorly and to the right	Clicking noise synchronous with throat	N/A	N/A	N/A	Clicks disappeared when neck in midline and in any position except down and to the right	After 3 months, remitted	N/A
Le Pajolec et al 1990	М	41	N/A	N/A	Ear click and palatal movement	80/min	N/A	N/A	N/A	Onset in late teens, had operation that was not effective; multiple medications were ineffective; quit working because clicks	N/A

										were so distracting; finally underwent botox which was effective; returns every 3 months for botox ; back at work	
Kadakia and McAbee 1990	F	9	N/A	N/A	Movements of the uvula and soft palate	180/min; irregular	N/A	N/A	Could attenuate and stop movements after several minutes of prolonged volitional mouth opening; recurred upon closure	No change at 1 year follow-up	N/A
Yokota et al 1990 Case 1	М	25	N/A	N/A	Bilateral ear clicks; soft palate movement	360/min, with frequent and transient interruptions of <1 sec; Ceased completely for several seconds when was distracted	No	N/A	N/A	Stable, no change after 2 year follow-up	Began after he was transferred to a new job and wanted to be transferred to his old one
Yokota et al 1990 Case 2 (Case 10 in text)	F	16	N/A	Anxiety, nervousness, being excited	Pharynx, larynx, masseter; synchronous	240-300/min	No	N/A	N/A	Did not respond to clonazepam or valproic acid Responded to placebo injection during hospitalization 2 years after onset; stopped	Preceding attacks she felt insects were moving in her brain; attacks always occurred when she was with someone else

										completely after physicians noted placebo effect and explained that the disease was benign and transient	
Deuschl et al 1991	M	52	Episode of vertigo and nausea that responded to metoclo- pramide 1 week prior	N/A	Bilateral ear clicks, bilateral contractions of the muscles of the walls of the eustachian tube, synchronous with ear clicks	101/min; rhythmic	Yes	"disturbed sleep"	N/A	8 months after onset responded to botox to TVP; duration of effect 3 months, no further follow-up	Hearing loss in right ear
Borggreve and Hageman 1991 (Case 2 in text)	M	23	N/A	Stress	Ear clicks and bilateral, symmetrical myoclonus of soft palate	N/A	N/A	N/A	N/A	Valproate resolved myoclonus within a few days; dose reduction after a few months led to reappearance of palatal myoclonus; increasing dose gave incomplete improvement; clonazepam had no additional benefit; eventually a regimen of valproate and orfenadrine stopped clicks	N/A
Saeed and Brookes	M	25	Presented with right	N/A	Ear click on right	N/A	N/A	N/A	N/A	Headache responded to	N/A

1993 Case 1			sided headache, blurry vision, episodic dysphagia and clicking in both ears		synchronous with bilateral myoclonic activity of soft palate					psychiatric assessment and anxiolytics; botox to bilateral soft palate resolved tinnitus at 4 and 12 weeks	
Saeed and Brookes 1993 Case 2	F	52	N/A	N/A	Audible tinnitus synchronous with rhythmical movements of soft palate	N/A	N/A	N/A	N/A	Did not respond to antidepressants, antiepileptic agents, physiotherapy, or relaxation exercises; patient was seen at age 64; botox resulted in benefit for a few hours; 4 th injection had no effect; 3 months later had another injection with "marked improvement"	N/A
Saeed and Brookes 1993 Case 3	F	63	N/A	N/A	N/A	N/A	N/A	N/A	N/A	Antidepressants and anxiolytics were unhelpful; carbamazepine was somewhat effective but developed rash; did not respond to tinnitus masking device or eustachian tube diathermy; responded to	N/A

										botox at 1 year follow-up and required repeat injections	
Deuschl et al 1994 Case 1	F	23	N/A	Stress	Left > right ear clicks; anterior soft palate in 4 patients and to pharynx, floor of mouth bilaterally and outer larynx in one patient	420/min	No	N/A	Source of psychologica l stress	25 year duration; slowly progressive	ТМЈ
Deuschl et al 1994 Case 2	F	45	N/A	Stress	Left > right ear clicks	173/min	No	N/A	Stopped with speaking and singing	No progression; 15 year duration	TMJ
Deuschl et al 1994 Case 3	М	59	N/A	Stress	Left ear clicks	26/min	No	N/A	N/A	Slowly progressive over 3 years	N/A
Deuschl et al 1994 Case 4	М	28	N/A	Stress and sleep deprivation	Left ear clicks	158/min	No	N/A	N/A	14 year duration; no progression	Postural and action tremor
Tomkinson et al 1995	М	50	No	No	Bilateral tinnitus/ear clicks synchronous with palatal movement	120/min	N/A	N/A	Anterior neck flexion could abolish myoclonus; tongue protrusion inhibited it, while eliciting gag reflex, temporary cessation was also noted	6 month history; stable	N/A

Scott et al	F	34	N/A –Car	N/A	Bilateral ear	70/min	Yes	N/A	Partial relief	Noted that ear	Migraines
1996			accident 6		clicks,				by extension	clicks responded	_
			years		synchronous				of neck	to sumatriptan,	
			earlier		elevation of					which was given	
					uvula and					for migraines:	
					both sides of					clicks ceased	
					the soft palate					within minutes	
					uie sore puiace					and effect lasted	
										a few hours	
Varnev et al	F	59	No	N/A	Bilateral ear	74-84/min	Yes	N/A	N/A	Gradual onset 8	N/A
1996	-	0,2	110		clicks and	,	100	1.011	1011	vears prior:	1011
Case 1					nalatal					could not	
Cuse I					movement					tolerate medical	
					movement					treatment due to	
										side effects.	
										botov was	
										injected into	
										TVP and LVP	
										hilatorally:	
										responded after	
										first day:	
										first day,	
										7 month follow	
										/ monul lonow-	
Columnat of	Б	6	No	NI/A	bilataral aar	00/min	Vac	NI/A	NI/A	up Trial of	Mignoines
LOO7	Г	0	INO	N/A	olialeral ear	90/11111	ies	IN/A	IN/A		Migraines
1997 (Casa 2 in					clicks and soft					cionazepani	
(Case 5 In					palate					unsuccessiui;	
text)					movement					valproic acid	
										decreased	
										frequency to	
										$42/\min$ but	
										clicks were still	
										disturbing;	
										ilunarazine was	
										added for	
										migraine and	
										clicks stopped;	
										returned when	
										flunarazine, but	
										not valproic acid	
									1	was stopped;	

										reattempted taper of flunarazine 2.5 years later, and palatal tremor increased again	
Vieregge et al 1997	F	69	N/A	N/A	Ear clicks synchronous with bilateral, symmetric tremor of soft palate and TVP movement; intermittent movement of floor of mouth; continuous, movements of left pinna that were not time locked to palatal movement	120/min; irregular	No	N/A	She could relieve ear click by pressing a pillow against the left ear or by finger pressure on the tragus or the retro auricular region; did not help ear wiggling	Did not respond to trials of trihexyphenidyl and gabapentin; botox of retro auricular muscle alleviated ear movement but not the palatal tremor or clicks	30 year history of involuntary wiggling of left ear that was aggravated by emotional distress
Klein et al 1998 Case 1 (Case 8 in text)	Μ	21	3 months earlier had otitis media		Left ear click synchronous with left TVP	150/min	N/A	No – only voluntarily	Could voluntarily switch the sound on or off by thinking about them and could modulate the frequency; could stop them actively, but semiconscio usly provoked	Stable; no treatments tried	No

									them		
Klein et al 1998 Case 2 Sister of case 1 (Case 8 in text)	F	26	N/A	N/A	Bilateral ear clicks; contraction of TVP, contractions of floor of mouth	N/A	N/A	Voluntarily	Could voluntarily provoke, stop, modulate frequency	Stable, no treatments tried	No (father reported similar voluntary modulation of palatal movements transiently in the past)
Bryce and Morrison 1998 Case 1	F	28	Distant history of closed head injury	N/A	Ear click synchronous with symmetric, bilateral contractions of soft palate	1 click at up to 10 sec intervals	N/A	N/A		4 year stable course; did not respond to 2 weeks of carbamazepine; got botox to bilateral TVP; 1 month later clicking on right decreased and on left it ceased; lost to follow-up after a few injections	N/A
Bryce and Morrison 1998 Case 2	F	40	N/A	N/A	Ear click synchronous with contraction of soft palate	40/min; irregular			N/A	2 months after onset in left ear, right side became affected; trials of carbamazepine, anesthetic injection into soft palate, and tinnitus masker were ineffective; botox into TVP resulted in stopping of movement in left ear, right sided tinnitus	

										remained; continued to receive botox every 2 months in alternating sides and is symptom free	
Pakiam and Lang 1999 Case 1	F	40	N/A	N/A	Ear clicks and palatal tremor (soft palate)	N/A; variable rhythmicity	N/A	Distractible	Improved when lying on her right side	Present for several years; did not respond to intranasal injection of sumatriptan	
Pakiam and Lang 1999 Case 2	М	40	N/A	N/A	Bilateral ear clicks and palatal tremor (ant part soft palate)	N/A; irregular	N/A	Entrainable	Could control them for short periods but were otherwise present 95% of the time	Stable for 2 years; did not respond to intranasal sumatriptan	
Seidman et al 1999 Case 6 (Case 9 in text)	Μ	39	Learned it after scuba diving	N/A	Ear clicks, palatal myoclonus	Varied between 1- 60/min	N/A	N/A	Learned to open and close tubes while scuba diving 15 years earlier; since then he could control each side independentl y and together; to make tinnitus in 1 ear, had to inhale; in 2 ears, had to exhale; could	N/A	N/A

									control frequency		
Fabiani et al 2000	F	66	N/A	N/A	Left ear click, involuntary movement of soft palate	60-80/min; irregular	N/A	N/A	N/A	3 year duration; noticed ear click and involuntary movements of throat and at same time noticed hearing loss; clicks responded to clonazepam	History of hypothyroidism; bilateral sensorineural hearing loss on audiometry
Jero and Salmi 2000 (Case 12 in text)	F	12	N/A	N/A	Right ear click, soft palate movement	120/min	Present	N/A	N/A	Present for 2 years; stopped after a botox injection into TVP; still absent at 1 year follow- up	N/A
Cho et al 2001	М	19	N/A	N/A	Clicking in both ears; rhythmic vertical oscillations in both sides of soft palate were synchronous; rhythmic contractions of temporalis, tongue, floor of mouth, pharyngeal wall, and mentalis – also rhythmic; head nodding at slower	90-160/min; rhythmic	N/A	N/A	Could make it louder with concentratio n and at will; in lateral decubitus position clicking sound ceased; when spoke or opened his mouth the contractions decreased in rate or ceased briefly;	Present for 2 years before treatment;ear clicks and all other movements stopped after 1 session of botox	Sound bothered him to point that it interfered with job and he "felt like he was going insane"

					frequency (60-90)				suppressed briefly by tongue depressor pushing on tongue and teeth clenching; stopped after 1 injection of botox		
Wakata et al 2002	М	27	Nasal obstructio n and postnasal discharge 1 month prior to onset	N/A	Ear clicks were not synchronous with eustachian tube opening, soft palate, pharynx, or larynx	300/min	Yes	N/A	Could induce myoclonus by focusing attention on throat; within 3 months of onset, seemed entirely voluntary; could discontinue it by himself and could do 2 rhythms (50 and 90 hertz)	Some response to carbamazepine, then disappeared without medication but continued to be able to voluntarily induce it	
Nasr and Brown 2002 (Case 1 in text)	M	32	N/A	N/A	Bilateral ear clicks, palatal myoclonus	N/A	N/A	N/A	N/A	Present for 9 years; was very distressed by it and excessively used alcohol because of it; was put on thioridazine for acute psychosis in setting of alcohol use and	Alcohol abuse that he self prescribed for palatal myoclonus; very preoccupied with clicks and held front of neck most of the time

											then Lamictal was started; clicking sound disappeared and frequency of palatal movements became slower; after discharge	
											he went back to alcohol use and stopped lamicital; clicks restarted	
Kutuk al 200 Case 1	cu et 13 1	М	14	N/A	N/A	Bilateral clicks, movements of soft palate	120/min; rhythmic	N/A	N/A	N/A	Treatment with clonazepam, piracetam, valproic acid, amitriptyline, and carbamazepine failed to improve symptoms; 6 days after botox to TVPs bilaterally, movements disappeared; response lasted for 1 year	N/A
Kutuka al 200 Case 2 Monoz c twin case 1	ccu et 13 2 zygoti a of	Μ	37	N/A	N/A	Bilateral clicks, movement of soft palate	90/min; rhythmic	N/A	N/A	N/A	Treatment with carbamazepine and valproic acid had no effect; a positive response to single injection of botox lasted for 6 months	N/A
w 1111a	uns	Г	41	rign	IN/A	Dilateral	104/mm	INO	res	1		

2003			period of		clicking,			distractible			
(Case 11 in			anxiety in		intermittent			to point of			
text)			relation to		symmetrical			disappearin			
			birth of a		movement of			g			
			niece		tympanic						
			whose		membrane						
			mother		and soft						
			had major		palate of						
			depression		variable						
			and was in		amplitude						
			an abusive		-						
			relationshi								
			p; also,								
			became								
			aware of a								
			neighbor								
			who had a								
			"true"								
			palatal								
			tremor								
Samuel et al	F	11	Neck pain	N/A	Right ear	120/min	Yes	Yes	Breath	Stable;	N/A
2004			and		clicks,				holding	treatment with	
Case 1			headache		symmetric				stopped	clonazepam	
			for years		palatal				clicking	transiently	
			prior;		elevation				U	helped but was	
			went to							stopped due to	
			chiropract							drowsiness	
			or, heard a								
			sudden								
			crack, and								
			then ear								
			clicks								
			started								
Samuel et al	М	31	Began	N/A	Bilateral ear	N/A	N/A	Yes	Could	Initially only	Anxiety disorder,
2004			after a		clicks			(voluntarily	induce them	present when he	obsessive symptoms
Case 2			cold)	by thinking	had a cold,	with tendency to spend
									about them,	within 2 years it	time cleaning and
									but they	was present each	putting things in order
									would	time he	
									attenuate	swallowed	
									and then he		

									could reinduce them after 5- 10 seconds; stopped by pressing tongue to floor of mouth; not severe enough to warrant treatment		
Morini et al 2005 Case 1	F	37	N/A	N/A	Clicks and contractions of the soft palate and the mouth floor	235/min; "pseudorhyth mic"	N/A	No significant change upon distraction	Completely relieved by holding a pen between her teeth, chewing, and speaking; disappeared with slight active or passive mouth opening	3-year follow- up, no response to gabapentin but improvement with clonazepam	N/A
Morini et al 2005 Case 2	F	35	Dental extraction 7 years prior, immediate ly followed by involuntar y sideways movement s of the right	N/A	Clicks and movements of the soft palate and pharyngeal muscles	300/min; "pseudorhyth mic"	N/A	No significant change upon distraction	Could be relieved by chewing and during speaking, disappeared with slight active or passive mouth opening	Gabapentin was ineffective, tryesphenidile suppressed muscle jerks, clonazepam improves PT	N/A

					1		1	1			
Ross and Jankovic 2005	F	16	cheek and mouth floor. Then following a "drug withdrawa l" six years later, she developed rhythmic clicking sounds associated with pain Severe upper respirator y infection	None	Objective clicks upon inspiration (patient unaware of them), contractions of the palate, pharynx, and larynx during	Frequency N/A; rhythmic, contractions occurred in couplets	Absent	No	No	No response to multiple drugs including botulinum toxin, clonazepam, and iv IG; Trial of sumatriptan resulted in change in	Dysphagia for solids and liquids
			y infection		(patient unaware of them), contractions of the palate, pharynx, and larynx during inspiration, after one year, patient noted a "swishing" sound	contractions occurred in couplets				botulinum toxin, clonazepam, and iv IG; Trial of sumatriptan resulted in change in pattern, leviteracetam resulted in a decrease in frequency of contractions	

N/A = Not available: item was searched for in text, but was not documented adequately " " = direct quote from published case TVP = tensor veli palatini