

**Table e-1. Summary of HT cases from published research.**

<b>REFERENCE</b>	<b>GENDER/AGE (years)</b>	<b>ETIOLOGY</b>	<b>SITE OF LESION</b>
Holmes G, Brain 1904. (1)	F/59	Vascular	Midbrain (assumed by author)
	F/37	Trauma	Midbrain
	M/21	Tumor	Dorsal half of mid-brain, extended into the thalamus (dorsal and medial nucleus), hippocampal gyrus, upper half of fourth ventricle, left lateral lobe of cerebellum
	M/6	Tumor	Midbrain (left side)
	M/5	Not mentioned	Midbrain (left side)
	M/15	Tumor	Midbrain (right side) and right optic tract
	F/37	Tumor	Midbrain
	M/47	Vascular	Midbrain (left side)
	M/57	Vascular	Midbrain (right side)
Kremer W, J Neurol Neurosurg Psychiatry 1947. (28)	M/34	Trauma	Midbrain
	M/19	Trauma	Midbrain
	M/21	Trauma	Midbrain
Fujieda T, Br Med J 1974. (14)	M/44	Vascular	Midbrain?
Findley L, Br Med J 1980. (15)	M/51	Vascular (hemorrhage on arteriovenous malformation)	Midbrain (right side)
Andrews J, J Neurol Neurosurg Psychiatry 1982. (35)	M/19	Trauma	Midbrain
	F/22	Trauma	Midbrain
	M/24	Trauma	Midbrain
Fahn S, Mov Disord 1986. (37)	F/54	Vascular (hemorrhagic stroke)	Subthalamic region and rostral part of left red nucleus
Biary N, Neurology 1989. (8)	M/48	Trauma	Normal MRI
Koppel B, Mov Disord 1990. (21)	M/35	Toxoplasma abscess	Midbrain
Samie M, Neurology 1990. (5)	M/42	Trauma	Cavitated lesion in the tegmentum of the left upper pons and gliotic area extending

			to central midbrain. Pseudohypertrophy of left inferior olivary nucleus
	M/21	Trauma	A retrosilvian mass of the internal cerebral vein was found by angiography. A brainstem involvement is also suspected by his sign/symptoms
	M/21	Trauma	Midbrain (left)
Pomeranz S, Acta Neurochir (Wien) 1990. (85)	F/20	Tumor (vascular hamartoma irradiated)	Authors assume that tumor irradiation distorted midbrain
Harmon R, Brain Inj 1991. (25)	F/36	Trauma	Right thalamic and Midbrain
Krauss J, J Neurol Neurosurg Psychiatry 1992. (49)	M/25	Tumor (astrocytoma)	Right thalamus, cyst extending to midbrain
	M/50	Tumor (astrocytoma)	Right postero-basal thalamus, red nucleus
	M/37	Tumor (astrocytoma)	Right thalamus, internal capsule, pallidum, putamen, corpus callosum, septum pellucidum, right frontal
	M/42	Tumor (astrocytoma)	Left basal ganglia, hemisphere, corpus callosum (diffuse, multifocal)
	M/15	Tumor (astrocytoma)	Left pallidum, putamen, corona radiata, compression of thalamus
	M/12	Tumor (astrocytoma)	Right thalamus, quadrigeminal plate
Friedman J, Mov Disord 1992. (86)	M/19	Drug induced HT (the patient had an old trauma and when the neuroleptic was introduced, HT appeared)	Right thalamus (dorsomedial nuclei) and right frontal lobe convexity
Okuda B, Stroke 1993. (64)	F/57	Vascular (ischemic)	Paramedian midbrain tegmentum
De Recondo A, Rev Neurol (Paris) 1993. (36)	F/30	Trauma (hemorrhagic)	Midbrain and right thalamus
Mosutto-Agatiello L, J Neurol 1993. (38)	F/53	Vascular (hemorrhagic)	Left thalamic hemorrhage with extension to subthalamus
Defer G, J Neurol Neurosurg	M/25	Vascular (hemorrhage on arteriovenous malformation)	Right midbrain, subthalamic and thalamic areas, and right superior cerebellar peduncle

Psychiatry 1994. (11)			
Krack P, Mov Disord 1994. (72)	M/26	Trauma	Right temporal subdural hematoma (evacuated). Right-sided upper cerebellar peduncle extending into the midbrain, right locus coeruleus and the lower dorsolateral part of the right substantia nigra
Remy P, Neurology 1995. (3)	F/31	Trauma	Upper peduncle and thalamus
	M/41	Trauma (bullet)	Upper peduncle
	M/46	Vascular (hemorrhagic stroke)	Upper peduncle
	M/25	Vascular (hemorrhage on arteriovenous malformation)	Upper peduncle and thalamus
	M/54	Vascular (hemorrhagic stroke)	Upper peduncle and thalamus
	M/32	Trauma (hemorrhage)	Upper peduncle and subthalamic region
Shepherd G, Mov Disord 1997 (10)	M/52	Vascular (hemorrhage)	Left pontine
Govaerts A, Mov Disord 1998. (89)	M/67	Vascular (posthypoxic)	Bilateral lesions in the head of the caudate nucleus and in the anterior part of the putamen
Jacob P, Mov Disord 1998. (88)	M/24	Trauma (hemorrhagic)	Left midbrain, thalamus and medial temporal lobe
Simonetti F, Mov Disord 1998. (90)	F/67	Paraneoplastic	No structural abnormalities in brain MRI
Deuschl G, Ann Neurol 1999. (59)	M/59	Initially right-sided cerebellar ablation for a Lindau tumor and 17 years later he developed Parkinson's disease with a right HT	Right cerebellum and nigrostriatal system
Miyagi Y, J Neurol 1999. (63)	M/49	Vascular (hemorrhage)	Left pontine tegmentum
Leung G, Mov Disord 1999. (84)	M/42	Vascular (cavernoma hemorrhage)	From lower aspect of right thalamus to the upper aspect of pons including midbrain tegmentum
Weng Y, Ghung Med J 2000. (62)	F/28	Vascular (hemangioma: hemorrhage)	Left midbrain
Kudo M, Mov Disord 2001. (80)	F/67	Vascular (cavernoma hemorrhage)	Right upper brainstem (pons and midbrain)
Pezzini A, Parkinsonism Relat Disord 2002. (19)	46	Toxoplasma abscess	Right thalamus and midbrain
Kim M, J Neurol	M/26	Tumoral (germinoma)	Midbrain tegmentum

Neurosurg Psychiatry 2002. (33)			
Mattos J, Arq Neuropsiquiatr 2002. (20)	M/34	Mass (co-infection of tuberculosis and toxoplasmosis in an HIV patient)	Left midbrain and left cerebellar hemisphere
Teive H, Mov Disord 2002. (92)	M/34	Neuroparacoccidiomycosis	Midbrain (right side)
Rieder C, Arq Neuropsiquiatr 2003. (4)	M/48	Vascular (hemorrhage)	Left pontine tegmentum, midbrain and thalamus
Romanelli P, J Neurosurg 2003. (74)	M/79	Undetermined cause	Normal neuroimaging studies
Samadani U, J Neurosurg 2003. (87)	M/24	Vascular (cavernoma hemorrhage)	Left midbrain
Goto S, J Neurol Neurosurg Psychiatry 2004. (58)	M/53	Vascular (hemorrhage)	Left pontine
Nikkhah G, J Neurosurg 2004. (71)	F/47	Vascular (infarction)	Midbrain
	F/32	Vascular (hemorrhage on arteriovenous malformation and two small aneurisms)	Left midbrain and thalamic region, extending to the left occipital lobe
Foote K, Neurosurgery 2005. (91)	M/8	Trauma	MRI normal
Paviour , Mov Disord 2006. (31)	M/25	Vascular (cavernoma hemorrhage)	Left of the midline in the upper brainstem
Chiou T, J Neurosurg 2006. (57)	M/20	radiosurgery adverse event (arteriovenous malformation)	Left thalamus extending to the tegmentum
Akkus D, Mov Disord 2006. (69)	M/57	Vascular (infarction)	Midbrain infarction involving right red nucleus and substantia nigra regions
Hertel F, J Neurosurg 2006. (77)	M/58	Vascular (infarction)	Midbrain
Tan J, Mov Disord 2006. (70)	F/53	Hyperglycemic	Reversible. No MRI abnormalities
Strecker K, Eur J Meurol 2007. (27)	M/51	Abscess (opportunistic infection in HIV patient)	Midbrain (red nucleus, substantia nigra and cerebral peduncle)
Zhong J, Chin Med J 2007. (29)	F	Vascular (cavernoma hemorrhage)	Midbrain
Roselli F, Mov Disord 2007. (67)	M/56	Brainstem encephalitis (Herpes Simplex Virus-1)	Right cerebral peduncle

Inci S, Surg Neurol 2007. (68)	F/60	Vascular (ossified cavernoma)	Thalamo-mesencephalic junction
Walker M, Mov Disord 2007. (30)	M/43	Vascular (cavernoma hemorrhage)	Right tectum pontis through the dorsal midbrain and olivary hypertrophy
Peker S, Childs Nerv Syst 2008. (55)	F/14	Cerebral abscess	Right thalamus
Sato S, Cerebrovasc Dis 2008. (61)	M/80	Vascular (infarction)	Caudal paramedian midbrain
Yerdelen D, Eur J Neurol 2008. (66)	F/38	Demyelinating (multiple sclerosis)	Pons, midbrain and supratentorial plaques
Ferlazzo E, Mov Disord 2008. (78)	M/19	Trauma (contusion)	Left midbrain
Kim D, Mov Disord 2009. (33)	F/81	Vascular (infarction). The patient had preexisting Parkinson's disease and after cerebellar infarction she developed HT	Left cerebellar hemisphere
Baysal L, J Neurol 2009. (50)	F/54	Vascular (infarction)	Right midbrain, bilateral hemispheres of the cerebellum, right thalamus and the right occipital lobe
Sanborn M, Stereotact Funct Neurosurg 2009 (75)	M/31	Multilobulated, multiseptated cystic degeneration lesion	Between thalamus and pons
Striano P, BMJ Case Rep 2009. (51)	M/61	Vascular (hemorrhage)	Left cerebellar hemisphere
Seidel S, J Neurol Neurosurg Psychiatry 2009. (65)	F/16	Vascular (cavernoma hemorrhage)	Pontine tegmentum, midbrain tegmentum involving almost the entire left-sided substantia nigra, red nucleus and components of the ipsilateral corticospinal tract
Shen Y, World J Biol Psychiatry 2009 (83)	M/23	Drug induced (risperidone)	
Gajos A, Acta Neurol Scand 2010. (7)	M/25	Vascular (hemorrhage on arteriovenous malformation)	Right thalamus
	M/25	Vascular (cavernoma hemorrhage)	Midbrain tegmentum, right substantia nigra, superior cerebellar peduncle
	F/68	Vascular (hemorrhagic stroke)	Left thalamus
	M/63	Vascular (infarction)	Superior cerebellar peduncle and left pons
	F/15	Vascular (infarction)	Right thalamus

	F/27	Vascular (infarction)	Right thalamus
	M/37	Vascular (hemorrhagic stroke)	Rubro-olivocerebellorubral loop, rubro-spinal fibers, nigro-striatal fibers
	F/20	Trauma	Midbrain tegmentum
	M/10	Trauma	No visible pathology
	F/42	Vascular (infarction)	Left thalamus
Lekoubou A, BCM Neurol 2010. (18)	M/35	Infection (toxoplasma abscess)	Right thalamus and internal capsule with edema extending downward to the upper mesencephalum
Schreuder F, Neurology 2010. (46)	M/69	Vascular (infarction)	Left medioventral midbrain
Acar G, Neurol Res 2010. (47)	M/31	Vascular (perimesencephalic subarachnoid hemorrhage)	Tetra-ventricular subarachnoid hemorrhage, parenchymal hemorrhage in tectum mesencephali on the left side
Grover P, BMJ Case Rep 2010. (48)	F/71	Tumoral	Right thalamus
Reese R, Mov Disord 2011. (60)	M/31	Trauma (Left subdural hemorrhage: evacuated)	MRI of high resolution showed no abnormalities (dopaminergic striatal denervation proven by SPECT)
Brittain J, Mov Disord 2011. (79)	36	Vascular (infarction)	Right cerebellum extending to midbrain
Coumou A, Mov Disord 2012. (23)	M/25	Suprasellar arachnoid cyst (acting by compression)	Midbrain
Boelmans K, Mov Disord 2012. (17)	F/39	Polycystic tumor	From the right diencephalic region into the mesencephalon and pons.
Suda S, J Neurol 2012. (53)	F/68	Vascular (aneurism of basilar artery/right superior cerebellar artery, intraparenchymal and subarachnoid hemorrhage)	Right midbrain
Rana A, Acta Neurol Belg 2012. (81)	M/76	Vascular (infarction)	Left midbrain and thalamic area
	M/65	Vascular (hemorrhage)	Hematoma in the inferior fourth ventricle, right thalamus, right posterior pons, and right anterior lentiform nucleus
	M/59	Trauma (hemorrhage)	Bilateral frontal intraparenchymal hemorrhages, mild bleed in anterior interhemispheric

			fissure, right midbrain involving the cerebral peduncle, left temporal contusion and a right subdural hematoma
Aydin S, J Neurol Surg A Cent Eur Neurosurg 2012	M/30	Vascular (cavernoma hemorrhage)	Midbrain and pons
Woo J, Ann Rehabil Med 2013. (16)	F/70	Vascular (hemorrhage)	Brachium pontis to the dorsal midbrain
Kipfer S, Mov Disord 2013 (22)	F/63	Vascular (infarction)	Pons (olivary hypertrophy)
Castrop F, Mov Disord 2013. (24)	43	Vascular (hemorrhagic stroke)	Midbrain
	40	Vascular (hemorrhage on arteriovenous malformation)	Pontomesencephalic
Aydin S, J Neurol Surg A Cent Eur Neurosurg 2013. (40)	M/30	Vascular (cavernoma hemorrhage)	Superior and inferior colliculus in the right tegmentum and right red nucleus with extension to the substantia nigra
Ahn S, Ann Rehabil Med 2014. (42)	M/29	Vascular (hemorrhage)	Left pons
Menon B, J Mov Disord 2014. (32)	F/35	Epidermoid cyst	Middle fossa and temporal
Follet M, Neuromodulation 2014. (39)	F/69	Trauma	Midbrain, thalamus
Menendez F, Tremor Other Hyperkinet Mov (N Y) 2014. (44)	M/27	Vascular (cavernoma hemorrhage)	Right midbrain
Chhetri S, Parkinsonism Relat Disord 2014. (56)	M/51	Vascular (hemorrhage)	Right side of midbrain which extended to the pontomedullary junction (right hypertrophic olivary degeneration)
Katchanov J, Neurology 2014. (54)	M/47	Opportunistic infection (progressive multifocal leukoencephalopathy isolated to the posterior fossa)	Right middle cerebellar peduncle
Kim M, J Cerebrovasc Endovasc Neurosurg 2014. (43)	F/54	Vascular (hypertensive hemorrhage)	Pons (bilateral hypertrophic olivary degeneration)
Bolen R, J Neurol	M/53	Vascular (hypertensive	Pons, midbrain (red nucleus),

Sci 2014. (73)		hemorrhage)	and left hypertrophic olivary degeneration
Kobayashi K, J Neurosurg 2014. (76)	F/19	Tumor (leukemia hemorrhage)	Brainstem and cerebellum
	M/67	Vascular (infarction)	Superior cerebellar peduncle And cerebellar hemisphere
	M/44	Vascular (hemorrhage)	Midbrain
	M/18	Trauma	Midbrain
Grabska N, Neurol Neurochir Pol 2014. (52)	F/15	Vascular (infarction)	Upper-posterior-lateral part of the left thalamus, ranging to the Vim nucleus
Gunnes V, Surg Neurol Int 2014. (45)	F/57	Infectious (progressive multifocal leukoencephalopathy in an immunocompetent patient)	Left midbrain
Ridz D, J Neurol Neurosug Psychiatry 2015. (82)	F/80	Anti-Yo cerebellar atrophy	Microscopic involvement of red nucleus, inferior olivary nucleus and cerebellum (autopsy)

**Table e-2. Summary of cases reported in published research treated with DBS.**

<b>Reference</b>	<b>Surgical target</b>	<b>Unilateral/Bilateral</b>	<b>Deep brain stimulation parameters</b>	<b>Evolution</b>
Kudo M, Mov Disord 2001 (80)	VIM	Bilateral	Using the most distal electrode with a plus polarity and the third electrode with a minus polarity, 100 µsec, right: 2.2 V, left: 1.7 V, 120-150 Hz	DBS produced almost complete disappearance of her head and arm tremor
Samadani U, J Neurosurg 2003 (87)	VIM	Unilateral (L)	1-, 2+, 90 µseg, 185 Hz	Resting and action tremor of the patient's right arm and trunk were extinguished by initiating DBS
Romanelli P, Mov Disord 2003 (74)	VIM and STN	Unilateral (L)	VIM: 0-, 3-, C+, 2 V, 90 µseg, 145 Hz STN: 0-,1-,2-,3-,C+, 4.3 V, 90 µseg, 185 Hz	Vim: poor control of resting tremor, partial resolution of postural

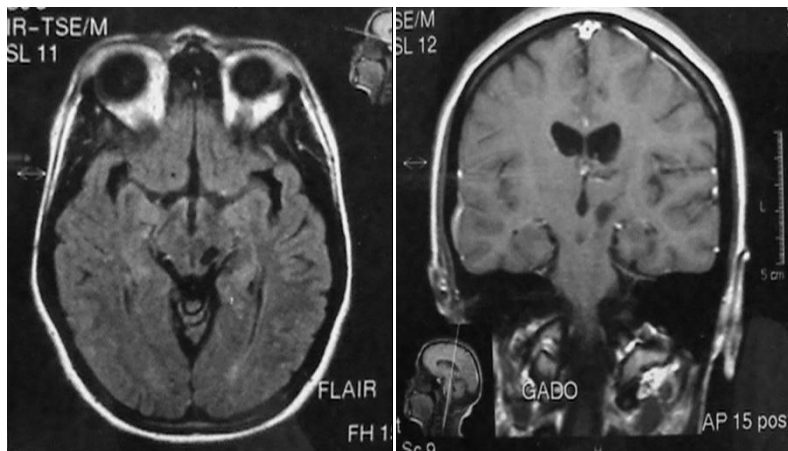


				tremor, complete resolution of intention tremor. STN: resolution of resting tremor but no effect on postural and intention tremor. When Vim and STN were stimulated: complete resolution of the tremor
Goto S, J Neurol Neurosurg Psychiatry 2004 (58)	VIM and Pallidotomy (GPi)	Unilateral (L)	0-, 1+, 3.4 V, 90 $\mu$ seg, 160 Hz	VIM: suppressed distal tremor, but did not control proximal tremor Pallidotomy completely abolished his proximal tremor
Nikkhah G, J Neurosurg 2004 (71)	Patient 1: VIM	Unilateral (R)	2.4 V, 60 $\mu$ seg, 130 Hz. Contacts not specified	Left side tremor improved almost completely, rigidity in her left arm and the hemidystonia were significantly alleviated, postural instability improved considerably
	Patient 2: VIM	Unilateral (L)	3.4 V, 90 $\mu$ seg, 130 Hz. Contacts not specified	80% improvement of tremor and of the dystonic posture of the right arm
Foot K, Neurosurgery 2005 (91)	VIM and VOA/VOP border	Unilateral (R)	VIM: C+, 2-, 4.1 V, 90 $\mu$ seg, 135 Hz VOA/VOP: C+, 0-, 4V, 90 $\mu$ seg, 185 Hz	The patient experienced a marked and sustained improvement (at the 6- and 12-month follow-up examinations) in tremor and disability
Hertel F, J Neurosurg 2006.	VIM	Unilateral (R)	They do not describe DBS	They followed the patient for

(77)			parameters	1.5 years
Peker S, Childs Nerv Syst 2008. (55)	VIM	Unilateral (R)	C +, 3 -, 4.8 V, 120 µseg, 180 Hz.	Improvement of 90% with a follow up of 30 months
Sanborn M, Stereotact Funct Neurosurg 2009 (75)	VIM	Unilateral (R)	VIM: 1.6 V, no other parameter mentioned	They followed the patient for 24 months with full suppression of tremor
Acar G, Neurol Res 2010 (47)	VIM	Bilateral	Case +, distal contact-, 4 V, 90 µseg, 185 Hz	At third month suppressed both extremity and orolingual tremors
Reese R, Mov Disord 2011 (60)	Dorsolateral STN and VIM	Unilateral (R)	STN: C+, 2-2.6 V, 60 µseg, 30 Hz. VIM: C+,5-, 1.5 V, 90 µseg, 130 Hz	Kinetic tremor required VIM stimulation. The others components responded to STN stimulation
Brittain J, Mov Disord 2011. (79)	Left VOP/ Zona incerta	Unilateral (L)	0-, 3+, 4.1 V, 120 µseg, 100 Hz	Rest and postural tremor were abolished. Partial suppression of intention tremor
Castrop F, Mov Disord 2013 (24)	Patient 1: VIM (2004)	Unilateral (L)	Case +, 0 -, 4.9 V, 60 µseg, 130 Hz	DBS produced good tremor suppression, whereas the other symptoms remained unchanged. Both patients remained on DBS until 2011, on that date the stimulation was turned off with no reappearance of tremor at one year of follow up
	Patient 2: VIM (2005)	Unilateral (L)	Case +, 1-, 2.0 V, 60 µseg, 130 Hz	
Aydin S, J Neurol Surg A Cent Eur Neurosurg 2013 (40)	VIM and GPi	Unilateral (right)	VIM: 3 V, 90 µseg, 100 Hz GPi: 3V, 210 µseg, 130 Hz	Follow up of 6 months Resting tremor: moderate improvement Postural tremor: moderate improvement

				Intention tremor: minimal improvement
Kobayashi K, J Neurosurg 2014 (76)	STN and VIM	Unilateral	135 Hz, 210 µseg. The contacts were not specified. Voltage not specified	Mean follow-up of these four patients was 25,8 +/- 35 months
	STN and VIM	Unilateral	135 Hz, 210 µseg. The contacts were not specified. Voltage not specified	
	STN and VIM	Unilateral	135 Hz, 210 µseg. The contacts were not specified. Voltage not specified	
	STN and VIM	Unilateral	135 Hz, 210 µseg. The contacts were not specified. Voltage not specified	
Grabska N, Neurol Neurochir Pol 2014. (52)	Area between ventralis oralis anterior and zona incerta (The choice of this target was based on the best reduction of the tremor during the operation)	Unilateral (left)	C+, 0 - (ZI), 2 - (Voa/Vop), 1.8 V, 185 Hz, 60 µseg	The improvement of postural and resting tremor was significant. Task-specific tremor was slightly reduced. Tremor of the right lower limb and ataxia in the upper one did not change. The device had to be explanted due to infection, and tremor reappeared
Follet MA, Neuromodulation 2014. (39)	VIM	Bilateral	Left: C+, 0-, 2 V, 60 µseg, 185 Hz Right: C+, 1-, 2.5 V, 185 Hz	Follow up of 18 (L) and 12 (R) months. She had functionally significant improvement in tremor
DBS: deep brain stimulation, STN: Subthalamic nucleus, VIM: ventralis intermedius nucleus, VOP: Ventralis oralis posterior, VOA: Ventralis oralis anterior, GPi: Globus pallidus internal part, ZI: zona incerta, R: right, L: left.				

Figure e-1: MRI (case 16) showing a post-traumatic lesion of left midbrain and left posterior thalamus



## e-References

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