Supplemental Table 1: Summary of DBS studies

Study	Patients (N)	Target	Bilateral vs. Unilateral	Tremor reduction (%)	Upper Extremity Tremor Reduction (%)	ADLs	Follow Up (months)
Alfonso et al 2010	11	VIM	Bilateral	70.6%			24.7+/-20.3
Baizabal-Carvallo et al 2013	13	VIM	Unilateral 6, Bilateral 7	47.5%	27%	31.7%	132.54 ±15.3
Blomstedt et al 2007	19	VIM	Unilateral	39.3%	60.3%	32.3%	86±9
Blomstedt et al 2010	21	PSA	Unilateral 19, Bilateral 2	95%	87%	66%	12
Blomstedt et al 2011	34	VIM	Unilateral 31, Bilateral 3	49%	70%	53.8%	28±24
Blomstedt et al 2011	34	PSA/cZI	Unilateral 31, Bilateral 3	62%	89%	66.1%	12
Blomstedt et al 2012	5	PSA/cZI	Unilateral 5	57%	20%		12-24
Bryant et al 2003	16	VIM	Unilateral 12, Bilateral 4	33.90%		44%	13
Chang et al 2012	5	VIM and PSA	Bilateral 5	57.70%			18.2±5.4
Cury et al 2017	38	VIM	Unilateral 3, Bilateral 35	66% at 1 year, 48% at 10 years			8.1+/-4.8
de Oliviera et al 2012	26	VIM	Unilateral 19, Bilateral	57.1%		53.8%	41

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Favilla et al 2012	28	VIM	Unilateral 19, Bilateral 9	22%			36
Fytagoridis et al 2010	27	PSA		91.0%			34
Fytagoridis et al 2012	18	cZI	Unilateral 16, Bilateral 2	52.4%	78%	65.8%	48.5+/-10.6
Graf-Radford et al 2010	31	VIM	Unilateral 22, bilateral 9	53.4% unilateral, 77.8% bilateral	38.2% unilateral, 66.0% bilateral		6
Hagglund et al 2015	26	cZI	Unilateral 19, Bilateral 7	*50% patients improved voice tremor*			54.2±31.1
Hamel et al 2007	8	PSA	Bilateral	80%			*At least 3 months*
Hariz et al 2008	19	VIM	Unilateral, Bilateral	47.4%			88±11
Herzog et al 2007	10	cZI	Bilateral	64.2±4.4%			6-41
Husset al 2015	70	VIM	Unilateral 13	62.8%	78.9%		8.6
Husset al 2015	70	VIM	Bilateral 57	79.5%	68.5-74.5%		13.1
Kumar et al 2006	5	VIM	Unilateral	62.0%			55.2
Koller et al 1999	38	VIM	Unilateral	All patients improved head tremor			12
Koller et al 2001	49	VIM	Unilateral	78.5%			40.2±14.7
Lee et al 2005	18	VIM	Unilateral	75.8%	64.3%		27
Lyons et al 1998	22	VIM	Unilateral 22	39.3%		57.9%	11
Mandat et al 2011	18	VIM	Unilateral 7, Bilateral 11	79.0%		61.0%	3

Murata et al 2003	8	cZI	Unilateral	81.0%			8-42
Nazzaro et al 2012	91	VIM	Unilateral	55% at 1 year, 31% at 9 years		73% at 1 year, 36..9% at 9 years	84 (up to 108)
Ondo et al 2001	22	VIM	Unilatera 11, Bilateral 1l	38% Unilateral, 65% Bilateral			3
Pahwa et al 2006	26	VIM	Unilateral 18, Bilateral 8	46% (5 years) Unilateral, 78% bilateral	75% unilateral, 65% left, 86% right	51% (5 years)- unilateral; 36% bilateral	60
Papavassiliou et al 2003	37	VIM	Unilateral 21, Bilateral 16	53+/-36%			26+/-16.2
Pedrosa et al 2014	17	VIM	Bilateral	71%			
Peng-Chen et al 2013	22	VIM	Unilateral	56%		67%	3.4+/-0.14 years
Pilitsis et al 2008	26	VIM	Unilateral 22, Bilateral 4	75.3%	73.8%		40+/-17 months
Plaha et al 2004	4	PSA	Bilateral	80.1%	68.0%	88.8%	12
Plaha et al 2008	6	cZI	Bilateral	75.9%			12
Plaha et al 2011	15	cZI	Bilateral	73.8%	60.10%	80%	31.7+/-28.6
Obwegeser et al 2000	27	VIM	Unilateral 14, Bilateral 13	82% Unilateral,			12 months
Rehncrona et al 2003	19	VIM	Unilateral 17, Bilateral 2	43%	56%		6.5+/-0.3 years
Sandvik et al 2012	19	PSA	Unilateral 17, Bilateral	58%	88%	71%	12

			2				
Sandvik et al 2012	17	VIM	Unilateral 15, Bilateral 2	48%	57%		66
Sydow et al 2003	19	VIM	Unilateral 12, Bilateral 7	46.40%	36.00%	51.70%	6.53+/-0.6 years
Taha et al 1999	15	VIM	Bilateral				10
Zhang et al 2010	34	VIM	Unilateral 23, Bilateral 11	80.4%	69.7%		56.9

Supplemental TABLE 2: Summary of complications from DBS

Study	Target	Speech	Dysarthria	Dysphasia	Hypophonia	Paresthesia	Ataxia	Hemiparesis	Other Complications
Alomar et al 2016	VIM Unilateral	12.30%	11.00%	9.90%	5%				
Alomar et al 2016	VIM Bilateral	41.4%	39.2%	18.8%	18.8%				
Baizabal-Carvallo et al 2013	VIM		33.3 57.1				16.7 85.7		23% hardware complications
Barbe et al 2014	VIM		10/26 (38.5%)						
Blomstedt et al 2010	PSA		38.1% transient						
Chandran et al 2017	PSA								83.3% dystonic tics
Earhart et al 2009	VIM						33%		

Fytagoridis et al 2010	PSA			22%				3.7% transient	
Gilard et al 2014	VIM								Dysgeusia
Kumar et al 2006	VIM								40% developed tolerancd to DBS at 3 or 12 months
Matsumoto et al 2016	VIM		22%						
Nandi et al 2004	PSA		16.7%					16.7%	16.7% Seizure
Pahwa et al 2006	VIM		75%			45%	56%		
Peng-Chen et al 2013	VIM	4.5%					9.1%	4.5%	9.1% mental decline, 4.5% air embolus, 4.5% mania/ hypomania

Zhang et al 2010	VIM					5.9%			23.5% hardware-related complications

Supplemental TABLE 3: Studies reporting results radiofrequency thalamotomy for essential tremor

Study	Patients (N)	Level of Evidence	Target	Follow up time	Tremor reduction (%)
Nagaseki Y, 1986	43 total 16 ET	4	Vim thalamus	Average 6.6 years	90.9% tremor free, one pt underwent reoperation
Mohadjer, 1990	65	4	Vim thalamus	Average 8.6 years	69% tremor free 11.9% moderate tremor
Goldman MS, 1992	8	4	VL thalamus	1-50 months	Grade 0: 4 pts Grade 1: 3 pts Disability: 21.1 to 3.9
Shahzadi, 1995	22	4	Vim thalamus	3 months-5 years	62% tremor free 86% significantly reduced
Jankovic J, 1995	60 total 6 ET	4	Vim thalamus	53.4 month, mean	83% of patients moderate-marked improvement
Tasker RR, 1998	45 total 6 ET patients	4	Vim thalamus	3-6 months	All patients: RF: 69% responders DBS: 79% responders
Akbostanci MC, 1999	43	4	Vim thalamus	1-13 months	Tremor grade Grade 0: 60.5% Grade 1: 13.9%
Zirh A, 1999	21	2b	Vim thalamus	3, 12 months	90% improved Overall: 13.4 to 4.5 Drawing: 6.3 to 2.9 Postural: 3.0 to 0.9 Action: 3.5 to 0.6
Sobstyl M, 2006	9	4	VL thalamus	24 months	CRST: Part B: 59%

					Part C: 62%
Niranjan A, 1999	39 total 13 RF	4	Vim thalamus		5/13 Arrest 6/13 Significant 2/13 Partial
Schuurman PR, 2000	68 total 45 PD 13 ET 10 MS	2b	Vim thalamus	6 months	Tremor grade RF: 6/6 Grade 0 DBS: 7/7 Grade 0
Pahwa R, 2001	34 total 17 RF 17 DBS	3a	Vim thalamus	27 months	Tremor score RF: 61.4 to 31.5 DBS: 61.6 to 30.5
Schuurman PR, 2008	46 total 10 ET	2b	Vim thalamus	5 years	Tremor grade RF: 3 Grade 0, 1 grade 1 DBS: 3 Grade 0, 1 Grade 1, 2 grade 2
Kim MJ, 2011	12 total	4	Vim thalamus	6 months	Tremor Score 58.8 to 30.9
Kim M, 2017	59 total 17 RF 19 DBS 23 FUS	4	Vim thalamus	12 months	Tremor relief RF: 70.6% DBS: 84.2% FUS: 78.3%

Supplemental TABLE 4: Complications from RF thalamotomy

Study	Paresthesia	Cerebellar/gait symptoms	Hemiparesis	Dysarthria	Other
Schuurman PR, 2000		1 Mild gait/balance distrubance		1 Dysarthria	1 Cognitive deterioration
Pahwa R, 2001	1 Patient (6%)		2 (12%)		1 Symptomatic ICH 5 ICH 5 Cognitive changes 7 Headache
Schuurman PR, 2008				1 Dysarthria	1 Cognitive deterioration
Kim MJ, 2011				1 Dysarthria	
Nagaseki Y, 1986	1 Persistent	5 transient	5 initial with improvement	3 Dysarthria 2 lasting dysarthria	
Mohadjer, 1990		17% transient 'minor' cerebellar deficit 5% Persistent gait deficit		25% transient speech deficit	
Goldman MS, 1992	2 Transient			2 Persistent Dysarthria	1 Verbal cognitive deficit
Jankovic J, 1995			34%	Dysarthria 29%	Confusion 20%
Tasker RR, 1998	19 permanent 4 transient	12 permanent 4 transient	15 hand ataxia	4 Permanent 8 transient	15% recurrence within 6

					months 4 ICH 4 Confusion
Akbostanci MC, 1999					5 Tremor recurrence 6 permanent speech/hemiparesis
Zirh A, 1999	1 Permanent	1 Patient		1 Patient	
Shahzadi, 1995	2 Persistent 3Transient	1 Persistent gait	1 Persistent	1 Transient dysarthria 1 Persistent dysarthria	1 ICH 1 Transient cognitive disturbance 4 procedures repeated 9 recurrences

Supplemental TABLE 5: Studies reporting results of GKRS for ET

Study	Patients (N)	Level of Evidence	Target	Follow up time (months)	Tremor reduction (%)
Friedman, 1999	17	4	Vim thalamus	3	68
Lim, 2010	14	2	Vim thalamus	7-30	7
Young, 2010	119	4	Vim thalamus	44	40
Ohye, 2012	72	4	Vim thalamus	24	48
Witjas, 2015	50	4	Vim thalamus	12	54
Cho, 2015	7	4	Vim thalamus	3-8	44
Tuleasca, 2017	38	4	Vim thalamus	12	63
Niranjan, 2017	73	4	Vim thalamus	28 (range 6-152)	68
Kondziolka, 2008	26	4	Vim thalamus	36	54
Kooshkabadi,	86	4	Vim thalamus	23	45

Supplemental TABLE 6: Studies reporting complications from GKRS for ET

Study	Paresthesia(%)	Gait/Ataxia(%)	Hemiparesis (%)	Dysarthria (%)
Friedman, 1999	0	17	8	8
Lim, 2010	9	0	9	9
Young, 2010	2	0	5	3
Ohye, 2012	0	0	0	0
Witjas, 2015	0	0	0	0
Cho, 2015	0	0	0	0
Tuleasca, 2017	0	0	0	0
Niranjan, 2017	0	0	0	0
Kondziolka, 2008	0	0	0	0
Kooshkabadi,	1	0	1	1

Supplemental TABLE 7: Studies reporting results of MRgFUS for ET

Study	Patients	Level of evidence	Target	Followup	Tremor Reduction (CRST)	Quality of Life (QUEST)
Lipsman et al. 2013	4	4	Unilateral Vim	1, 3 mo	Hand score: 89.4% at 1 mo and 81.3% at 3 mo	-
Elias et al. 2013	15	4	Right Vim	1 d, 1 wk, 1 mo, 3 mo, 12 mo	Mean score: 79% at 3mo, 74.5% at 12 mo	37% vs 12% at 12 mo
Chang et al. 2015	11	4	Right Vim	1 wk, 1 mo, 3 mo, 6 mo	CRST components: 5.1 to 1.4 (A) 13 to 2.6 (B) 13.5 to 2.8 (C) at 6 mo	-
Elias et al. 2016	76 (56 FUS, 20 Sham)	1b	Right Vim	1, 3, 6, and 12 mo	Mean score at 3 mo: 47% vs 0.1% (sham). At 12 mo: 35%, vs 2% (sham).	46% reduction of score at 3 mo, versus 3% (sham)
Gallay et al. 2016	21	4	Cerebellothalamic tract. Unilateral (18), Bilat(3)	2 d, 3 mo, 1 yr	Mean score: 55% ;57.6 ± 13.2 at baseline to 25.8 ± 17.6 at 1 yr.	-
Zaaroor et al. 2017	21 (18 ET, 3 ET-PD)	4	Unilateral Vim	1d, 1wk, 1-3mo , 6 mo	Mean score decreased from 40.7 ± 11.6 to 9.3 ± 7.1 at 1mo, and to 8.2 +/-5 at 6mo	44.8 ± 12.9 to 13.1 ± 13.2 at 1mo and 12.3 ± 7.2 at 6 mo

Kim et al. 2017	23	4	Right Vim	1wk, 1mo,12 mo	18 patients (78.3%) met criteria for success at 12mo . 8 (34.8%) had remission	-
Federau et al. 2017	7	4	Ventral VPL	1 mo, 12 mo	rel change: 58% ± 25% @ 1 mo, 55% ± 24% at 12 mo	-

Supplemental Table 8: Complications from MRgFUS for ET

Study	Paresthesia	Ataxia	Hemiparesis	Goal temperature not reached	Other
Lipsman et al. 2013	2 transient (50%), 1 persistent (25%)	-	-	-	1 leg DVT (25%)
Elias et al. 2013	14 transient (93%). 3 persistent (20%).	4 transient (28%)	1 transient (7%)	-	1 persistent dysesthesia (7%)
Chang et al. 2015	-	1 transient (9%)	-	3 (27%)	-
Elias et al. 2016	13 transient (24%). 8 persistent (14%)	15 transient (27%), 5 persistent (9%)	1 transient (2%), 1 persistent (2%)	5 (9%)	1 TIA (2%)
Gallay et al. 2016	-	4 transient (19%), 1 persistent (5)	-	-	-
Zaaroor et al. 2017	-	4 transient	-	-	-
Kim et al. 2017	-	1 transient (4%)	1 facial persistent (4%)	-	1 transient hypogeusia (4%)