

Commentary:

Epilepsy surgery represents a possible treatment for patients with drug-resistant epilepsy. The success of epilepsy surgery is based on the precise delineation of the epileptogenic zone. The epileptogenic zone is a brain area responsible for seizure genesis; its removal leads to seizure cessation. Now, we can measure epileptogenic zone only indirectly based on the results of the complex presurgical evaluation. This evaluation consists of several methods and techniques, namely, brain magnetic resonance imaging (MRI) and its post-processing, long-term video EEG monitoring, positron emission tomography (PET), neuropsychology, single-photon emission tomography (SPECT), subtraction ictal SPECT co-registered to MRI (SISCOM), and invasive EEG (IEEG). After a performance of selected methods, it is necessary to decide about a suitable therapeutical approach. In general, we can offer resective brain surgery or implantation of a neurostimulator (vagal nerve stimulator [VNS], deep brain stimulator [DBS]).

My habilitation thesis can be divided into two essential parts. In the first part, I focussed on the methods employed in presurgical evaluation. In the second part, I paid attention to the surgery with an impact on neurostimulation.

In the first-mentioned works, we analyzed both scalp EEG and IEEG. We studied the distribution of interictal epileptiform abnormality in patients with hippocampal sclerosis and its prognostic value for epilepsy surgery. I also contributed to an atlas of IEEG, which impacts both clinical and research works in the field of epileptology. The next paper is pursued to the ictal onset patterns in IEEG and their relationship to surgical outcome. We also studied high-frequency oscillations in IEEG. The critical part of video EEG is the evaluation of clinical semiology. We described a case report of a patient with an atypical manifestation of cardiac syncope or a patient with extra-temporal lobe epilepsy mimicking temporal lobe epilepsy. Then, we focused on the redistribution of critical brain function, handedness, conditioned by epilepsy. We also tried to improve PET by the development and improvement of its quantitative analysis. The last part of the first section is devoted to two clinically-important situations, i.e., MRI-negative and PET-positive temporal lobe epilepsy and bitemporal epilepsy.

The second part of my thesis is concerned with neurostimulation. Four works are devoted to VNS. Firstly, we focused on long-term outcomes and VNS effectiveness in individual age groups. We also developed a prediction algorithm for VNS efficacy based on scalp EEG

analysis. In the future, we would like to extend this algorithm about electrocardiogram (ECG) parameters. We published works about DBS, analysis of DBS intracerebral recordings from nucleus anterior thalami, and its adverse events. The last-mentioned article centers on resective surgery and its impact on the quality of life.

All these works aim to improve epilepsy surgery and daily-care for our patients. My contribution to the previously mentioned articles is summarized in the following tables with particular attention to experimental work, supervision, manuscript preparation, and research direction.

Annex 1: Dolezalova I, Brazdil M, Hermanova M, Janousova E, Kuba R. Effect of partial drug withdrawal on the lateralization of interictal epileptiform discharges and its relationship to surgical outcome in patients with hippocampal sclerosis. *Epilepsy Research* 2014;108(8):1406-1416. (IF=2,014)

Experimental work	Supervision	Manuscript	Research direction
80%	-	70%	30%

Annex 2: Frauscher B, von Ellenrieder N, Zelmann R, Dolezalova I, Minotti L, Olivier A, Hall J, Hoffmann D, Nguyen DK, Kahane P, Dubeau F, Gotman J. Atlas of the normal intracranial electroencephalogram: neurophysiological awake activity in different cortical areas. *Brain*. 2018;141:4. (IF=11,814)

Experimental work	Supervision	Manuscript	Research direction
25%	-	20%	-

Annex 3: Dolezalova I, Brazdil M, Hermanova M, Horakova I, Rektor I, Kuba R. Intracranial seizure onset patterns in unilateral temporal lobe epilepsy and their relationship to other variables. *Clinical Neurophysiology*. 2013;124(6):1079-1088.

Experimental work	Supervision	Manuscript	Research direction
80%	-	80%	30%

Annex 4: Pail M, Rehulka P, Cimbalnik J, Dolezalova I, Chrastina J, Brazdil M. Frequency-independent characteristics of high-frequency oscillations in epileptic and non-epileptic regions. *Clinical Neurophysiology*. 2017;128(1):106-114. (IF=3,614)

Experimental work	Supervision	Manuscript	Research direction
30%	-	20%	10%

Annex 5: Dolezalova I, Brazdil M, Rektor I, Tyrlikova I, Kuba R. Syncope with atypical trunk convulsions in a patient with malignant arrhythmia. *Epileptic Disorders*. 2013;15(2):171-174. (IF=2,979)

Experimental work	Supervision	Manuscript	Research direction
80%	-	80%	50%

Annex 6: Dolezalova I, Brazdil M, Kahane P. Temporal lobe epilepsy? Things are not always what they seem. *Epileptic Disorders*. 2017;19(1):59-66. (IF=1,500)

Experimental work	Supervision	Manuscript	Research direction
80%	0%	80%	30%

Annex 7: Dolezalova I, Schachter S, Chrastina J, Hemza J, Hermanova M, Rektor I, Pazourkova M, Brazdil M. Atypical handedness in mesial temporal lobe epilepsy. *Epilepsy & Behavior*. 2017;72:78-81. (IF=2,600)

Experimental work	Supervision	Manuscript	Research direction
60%	30%	80%	40%

Annex 8: Kojan M, Dolezalova I, Koritakova E, Marecek R, Rehak Z, Hermanova M, Brazdil M, Rektor I. Predictive value of preoperative statistical parametric mapping of regional glucose metabolism in mesial temporal lobe epilepsy with hippocampal sclerosis. *Epilepsy & Behavior*. 2018;79:46-52. (IF=2,378)

Experimental work	Supervision	Manuscript	Research direction

40%	20%	30%	30%
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Annex 9: Dolezalova I, Brazdil M, Chrastina J, Hemza J, Hermanova M, Janousova E, Pazourkova M, Kuba R. Differences between mesial and neocortical magnetic-resonance-imaging-negative temporal lobe epilepsy. *Epilepsy & Behavior*. 2016;62:21-26. (IF=2,631)

Experimental work	Supervision	Manuscript	Research direction
90%	30%	80%	30%

Annex 10: Rehulka P, Dolezalova I, Janousova E, Tomasek M, Marusic P, Brazdil M, Kuba R. Ictal and postictal semiology in patients with bilateral temporal lobe epilepsy. *Epilepsy & Behavior*. 2014;41:40-46. (IF=2.257)

Experimental work	Supervision	Manuscript	Research direction
30%	20%	30%	20%

Annex 11: Chrastina J, Novak Z, Zeman T, Kocvarova J, Pail M, Dolezalova I, Jarkovsky J, Brazdil M. Single-center long-term results of vagus nerve stimulation for epilepsy: A 10-17 year follow-up study. *Seizure – European Journal of Epilepsy*. 2018;59:41-47. (IF=2,765)

Experimental work	Supervision	Manuscript	Research direction
30%	-	30%	10%

Annex 12: Chrastina J, Kocvarova J, Novak Z, Dolezalova I, Svoboda M, Brazdil M. Older age and longer epilepsy duration do not predict worse seizure reduction outcome after vagus nerve stimulation. *Journal of neurological surgery part A – Central European neurosurgery*. 2018;79(2):152-158. (IF=1,060)

Experimental work	Supervision	Manuscript	Research direction
30%	-	30%	20%

Annex 13: Brázdil M, Doležalová I, Koritřáková E, Chládek J, Roman R, Pail M, Jurák P, Shaw DJ, Chrastina J. EEG reactivity predicts individual efficacy of vagal nerve stimulation in intractable epileptics. *Frontiers in Neurology*. 2019;10:392-392. (IF=2,635)

Experimental work	Supervision	Manuscript	Research direction
30%	20%	70%	20%

Annex 14: Plešinger F, Halánek J, Chládek J, Jurák P, Doležalová I, Chrastina J, Brázdil M. Response to vagal stimulation by heart-rate feature in drug-resistant epileptic patients. *Annual International Conferences of the IEEE Engineering in Medicine and Biology Society* 2020:46-49.

Experimental work	Supervision	Manuscript	Research direction
30%	20%	30%	40%

Annex 15: Doležalová I, Kunst J, Kojan M, Chrastina J, Baláž M, Brázdil M. Anterior thalamic deep brain stimulation in epilepsy and persistent psychiatric side effects following discontinuation. *Epilepsy Behavior Reports* 2019;12:100344.

Experimental work	Supervision	Manuscript	Research direction
80%	30%	90%	80%

Annex 16: Rektor I, Dolezalova I, Chrastina J, Jurak P, Halamek J, Balaz M, Brazdil M. High-frequency oscillations in the human anterior nucleus of the thalamus. *Brain Stimulation*. 2016;9(4):629-631. (IF=6,078)

Experimental work	Supervision	Manuscript	Research direction
30%	-	30%	20%

Annex 17: Doležalova I, Pešlová E, Michnová M, Nečasová T, Kočvarová J, Musilová K, Rektor I, Brázdil M. Epileptochirurgická léčba zlepšuje kvalitu života – výsledky dotazníkové studie. *Ceská a Slovenská Neurologie a Neurochirurgie*. 2016;79/112(4):430-439. (IF=0,368)

Experimental work	Supervision	Manuscript	Research direction
70%	70%	70%	90%