**Study on transcranial magnetic resonance-guided focused ultrasound treatment of neuropathic pain and movement disorders: safety, accuracy and initial clinical outcomes**

D. Jeanmonod, D. Moser, A. Magara, M. Kowalski, R. Bühler

**Introduction:** Recent technological developments in MR-guided focused ultrasound enable incisionless transcranial therapeutic interventions to the brain. The goal of this study is to establish the safety, targeting accuracy and efficiency of this technique in the treatment of neuropathic pain and movement disorders. We shall present clinical and neurophysiological data on 3 month and 1 year follow-ups of neuropathic pain patients, as well as initial results on parkinsonian and essential tremor patients.

**Methods:** Medial thalamic (central lateral nucleus) and subthalamic FUS thermocoagulations were performed under real-time MR-imaging and MR-thermometry guidance, applying peak temperatures between 50° and 60°.

**Results:** The mean absolute targeting accuracy for 30 targets was 0.44 mm for the mediolateral dimension, 0.38 mm for the anteroposterior dimension and 0.66 mm for the dorsoventral dimension. There were no device- or procedure-related complications and no post-treatment neurological deficits. Currently, 12 neurogenic pain patients present at 3-month follow-up a mean pain relief of 51.3%, a mean improvement of their visual analogue scale ratings of 35.7%, and 66.7% of them had a pain relief of or above 50%. A reduction of quantitative EEG spectral overactivities can be observed particularly in the delta and theta frequency bands.

**Discussion**: This study expands and confirms the already published evidence on MR-guided focused ultrasound in the treatment of neuropathic pain and brings first data on the treatment of movement disorders. This technology avoids the surgical risks related to brain penetration, and the real-time continuous MR-imaging and MR-thermometry allow an optimized lesioning safety and accuracy. Our experience has shown that the immediate effects of thermal lesioning could be used to enable a closed-loop control and optimization of target lesioning based on these two imaging modalities.

**Conclusion**: MR-guided focused ultrasound offers a safe and precise option for the treatment of neuropathic pain and movement disorders.