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**Title**

TRANS-CRANIAL MRI-GUIDED FOCUSED ULTRASOUND SURGERY (TCMRGFUS): PRELIMINARY ITALIAN (AND WORLD-FIRST) EXPERIENCE AT 1,5 TESLA

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**Body**

**Purpose:** We present our preliminary results achieved with the first Italian installation of a trans-cranial MRI-guided Focused Ultrasound Surgery (tcMRgFUS) certified system for functional neurosurgery. Moreover, to our knowledge, this is the world-first tcMRgFUS system ever installed on a 1.5T MRI unit. Technical issues faced to achieve a safe and effective treatment will be discussed focusing on MR high-resolution live imaging and thermometry sequences optimization.

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**Methods:** Patient enrollment was based on indication for functional neurosurgery and evidence of medication-refractory disease; a detailed medical history has been collected together with a complete clinical examination and a neurophysiological assessment. Eligible patients have been screened by MDCT and MRI. TcMRgFUS treatments have been performed by a neurosurgeon with proven experience in functional neurosurgery, and an experienced neuroradiologist, optimizing treatment parameters case by case.

**Result:** Although this is a preliminary experience, the clinical success of our first treatments proves that this promising new technology for non-invasive treatment of various brain disorders can be safely and effectively performed also with the most popular MRI units operating at 1.5T.

**Conclusion:** TcMRgFUS treatments are currently performed in a very few centers in the world and only using 3T MRI units. This is the world-first experience of functional neurosurgery successfully performed with a tcMRgFUS installed on the most popular and affordable 1.5T MR units.

Direct translational impacts are expected by the use of widely installed 1.5T MRI units both on patient quality of life and on savings in health spending, with reduction in the consumption of drugs, as well as in requests for medical examinations. Being able to use a radiation-free technique like the MRI as a guide and, even further, being able to verify the clinical effectiveness of such an innovative treatment before a permanent lesion is made in the targeted area of the brain is a huge step forward for both interventional radiology and functional neurosurgery.

**Keywords:** functional neurosurgery, focused ultrasounds, MRI-guided procedures