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## RESEARCH ARTICLE

# EVALUATION WITH REAL-TIME TISSUE ELASTOGRAPHY (RTE) OF SINGLE AND MULTIPLE FIBROIDS IN PATIENTS THAT UNDERWENT MAGNETIC RESONANCE-GUIDED FOCUSED ULTRASOUND (MRGFUS) TREATMENT

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Real-time Tissue Elastography (RTE),  
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### ABSTRACT

**Background:** patients affected by single and multiple uterine fibroids and that underwent Magnetic Resonance-Guided Focused Ultrasound (MRgFUS) treatment have been monitored in the post treatment phase with Real-time Tissue Elastography (RTE) in order to evaluate the flexibility and vascularization levels of MRgFUS treated fibroids.

**Methods:** from September 2015 to October 2016, 30 patients aged between 23 and 51 affected by single and multiple uterine fibroids (sized between 2 and 14 cm) have been monitored in our clinic unit through the Real-time Tissue Elastography (RTE) to examine the flexibility level of MRgFUS treated fibroids.

**Results:** In our operating unit, 30 patients out of 30 have undergone the evaluation through elastosonography before and after the Magnetic Resonance-Guided Focused Ultrasound (MRgFUS) treatment for single and multiple uterine fibroids. Beyond the elastosonography evaluation, patients have been closely evaluated by means of a complete gynecological examination, a transvaginal ultrasound, an MRI with and without contrast agent and a symptoms severity score (SSS) questionnaire. All the evaluations have been carried out for the selection of patients that had to undergo the focused ultrasound treatment and, after the treatment, a 3 months, 6 months and 9 months follow-up. 29 patients out of 30 had, after 12 months, a 75% reduction of the NVP, an 80% reduction of the SSS and a 70% reduction in average of the fibroid volume. With the use of elastosonography, the level of elasticity and vascularisation of the treated area has been highlighted.

**Conclusions:** elastosonography represents a diagnostic instrument in addition to the gynecological examination, the transvaginal ultrasound, the MRI with and without contrast agent and the symptoms severity score (SSS) questionnaire, in order to evaluate the effectiveness of focused ultrasound in the treatment of single and multiple uterine fibroids in women of childbearing age and not. Furthermore, it represents an extra tool in the evaluation of patients to be included in the focused ultrasound treatment and to evaluate the rigidity level of the fibroid after the treatment.

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## INTRODUCTION

Uterine fibroids are a benign pathology of the uterus. They can be single or multiple, submucosal, subserosal, intramural depending on the uterus portion where they are localized, and they have a 30% incidence in women after 40 (Ryan *et al.*, 2005; Sankaran, 2008). In 25% of women they are symptomatic, with a severe incidence on the quality of life and on the uterine functionality. Among the symptoms we can find metrorrhagia, anemization, pelvic pain, dyspareunia, pelvic pressure feeling, infertility, preterm delivery risk and abortion risk (Munro *et al.*, 2011).

Surgical therapies already existing are represented by a radical surgery approach (hysterectomy) or non radical approaches that preserve the organ (myomectomy): these practices, when possible, can both be carried on by laparotomy, laparoscopy or hysteroscopy. (Taniguchi *et al.*, 2016) In any case, patients undergo a surgical intervention, with all the possible annex contraindications and risks. (Bhave Chittawar, 2014). The use of Magnetic Resonance-Guided Focused Ultrasound for the treatment of uterine fibroids do not envisage any surgical cut with following blood loss or adhesions' formation, it is carried on without general anesthesia (just a mild sedation), it requires only a day surgery hospitalization and only 2 days for the recovery. (Ferrari *et al.*, 2016; Mascaretti *et al.*, 2016)

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## METHODS

From September 2015 to October 2016, 30 patients aged between 23 and 51 were evaluated and underwent the treatment of single and multiple uterine fibroids of different types (sized between 2 and 14 cm) in our Operating Unit.

Every patient has been previously examined by the means of a complete gynecological examination, a transvaginal ultrasound, an MRI with and without contrast agent, a symptoms severity score (SSS) questionnaire and Evaluation with Real-time Tissue Elastography (RTE). All the named exams have been conducted both before the treatment and after it, with a 3, 6, and 12 months follow-up.

## RESULTS

After a close evaluation of the patients with a complete gynecological examination, a transvaginal ultrasound, an MRI with and without contrast agent, a symptoms severity score (SSS) questionnaire, 30 of them underwent an evaluation with Real-time Tissue Elastography (RTE) in order to analyse the level of elasticity of their fibroids (Mascaretti, 2016).

**Table 1.**

	3 Months	6 Months	12 Months
NPV	30%	50%	75%
SSS	40%	60%	80%
Volume	30%	50%	70%

The patients have been considered as excellent candidates for the Magnetic Resonance-Guided Focused Ultrasound treatment to whom they have been exposed. The 3 months follow-up showed that 29 patients out of 30 obtained a 30% NPV% reduction. This value has been achieved thanks to an MRI with and without contrast agent. Furthermore, a 30% reduction of the fibroid volume has been measured in 29 patients out of 30, through an MRI and transvaginal ultrasound. A 40% reduction of symptoms has been measured in 29 patients out of 30, through the (Symptom Severity Score) (Parker, 2007). The 6 months follow up highlighted a 50% NPV% reduction in 29 patients out of 30; a 50% reduction of the fibroid volume in 29 patients out of 30; a 60% reduction of symptoms in 29 patients out of 30. The 12 months follow-up detected a further NPV% reduction up to 75% in 29 patients out of 30; a 70% volume reduction in 29 patients out of 30; a 80% Symptoms reduction in 29 patients out of 30. These patients underwent an examination through RTE before the MRg FUS treatment (Magnetic Resonance-Guided Focused Ultrasound) and in the next follow-up (3 months, 6 months, 12 months) it was pointed out that patients showed a reduction of the fibroids rigidity level, which goes together with the volumetric reduction and the symptoms reduction.

## Conclusion

The non invasive surgery which uses Magnetic Resonance-Guided Focused Ultrasound (MRgFUS) is a valid alternative to classical surgery for the single and multiple uterine fibroids treatment in women who are in childbearing age and who want to preserve their fertility and in women who are not anymore in childbearing age but who presents the symptomatology (Mukhopadhaya *et al.*, 2007; Zepiridis, 2015; Parazzini *et al.*, 2015). Patients present a clear reduction of the volume and of the symptoms: this is due to the substitution of the solid tissue

with coagulative tissue that makes the fibroid tissue non functional. The use of Real-time Tissue Elastography (RTE) before and after the MRgFUS treatment demonstrated that there is a reduction of the rigidity that can be quantified by SR parameter. This is an additional tool, and does not substitute The MRI with and without contrast agent, a transvaginal ultrasound and a symptoms severity score evaluation through the SSS questionnaire in the initial evaluation of the patients in order to include or exclude them from the Magnetic Resonance-Guided Focused Ultrasound (MRgFUS) treatment.

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