

## MRI-BASED 3D PATIENT-SPECIFIC RECONSTRUCTION OF UTERINE FIBROMATOSIS: IMPACT ON SURGERY.

Clara Baroni, Andrea Giannini, Veronica Iodice, Eugenia Picano, Eleonora Russo, Virna Zampa, Vincenzo Ferrari, Tommaso Simoncini

**Introduction:** Myomas offer relevant challenge even to skilled surgeons, and often limit the possibility to achieve hysterectomy in a mini-invasive approach, especially in case of very large uteri. Myomectomy can be even more challenging, since extensive ablation of myomas needs to be obtained, while preserving the function of the uterus.

We applied a MRI-based 3D reconstruction of the uterus anatomy testing its diagnostic accuracy and impact on planning and performance of surgical procedures for uterine fibromatosis.

**Materials/Patients and Methods:** Patient-specific 3D models of the uterus of 18 women with symptomatic fibromatosis selected for surgery were obtained from MRI images with semi-automated segmentation routines; the women had been selected for MRI for different clinical gynaecological or not gynaecological reasons, not for the fibromatosis itself. The images were shown to the surgeon at the time of pre-surgical planning and during surgery. Diagnostic accuracy of the 3D reconstruction vs. transvaginal ultrasound in identifying and locating the myomas was tested. The impact of the 3D modeling on the choice and the performance of surgery was compared with 30 similar procedures where MRI was not available.

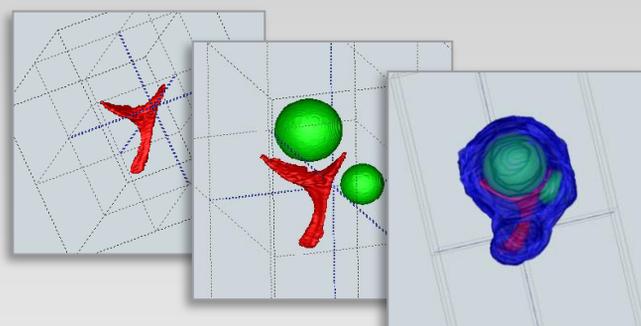


Figure 1. Process of segmentation from MRI images with identification of endometrial cavity, uterus and myomas.

**Results:** Sensitivity and specificity of the 3D MRI imaging system was higher than transvaginal ultrasound, respectively 97% vs. 62% and 98% vs. 76%. Pre-operative visualization of the 3D images induced to shift from a pre-surgical plan of open surgery to a mini-invasive technique in 22% of patients and from laparoscopic total hysterectomy to laparoscopic myomectomy in 31%. Operation time for myomectomy was shorter if MRI reconstruction was available, with a mean of  $28 \pm 11$  min vs.  $47 \pm 31$  min, and the number of intraoperative consultations of MRI reconstruction images was higher in cases of large uteri with a lot of fibroids.

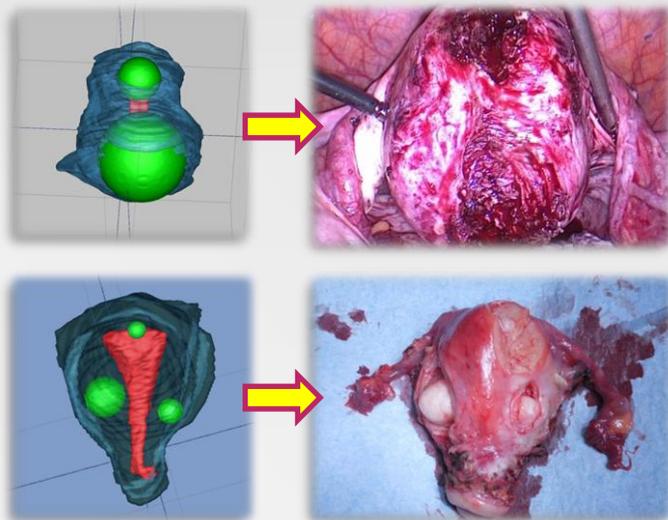


Figure 2. 3D reconstruction of uteri with fibroids and their corresponding real images, the first one during laparoscopic myomectomy and the second one in the surgical specimen after hysterectomy.

**Conclusions:** 3D imaging of uterus with a MRI-based system identifies and locates myomas with high sensitivity and specificity and appears to be useful for both planning and execution of surgery. Even if the perform of MRI and 3D reconstruction did not determine any statistically significant difference in perioperative outcome, the anatomic accuracy of the images and intraoperative identification of detailed anatomical landmarks could allow a conservative or mini-invasive surgical approach in uterine fibromatosis.