

## Peduncolated Mixoyd Leiomyoma: MR Imaging and Spectroscopy

Fiaschetti Valeria<sup>1</sup>, Fabiano Sebastiano<sup>1</sup>, Irene Coco<sup>1\*</sup>, Barbara Vasapollo<sup>2</sup>, Herbert Valensise<sup>2</sup> and Simonetti Giovanni<sup>1</sup>

<sup>1</sup>Departement of Radiology, Tor Vergata Univesity, Italy

<sup>2</sup>Departement of Gynecology and Obstetrics, Tor Vergata Univesity, Italy

### Abstract

Leiomyoma is the most common uterine tumor that occurs in more than 20% of women older than 30 years. This tumor presents different types of degenerations and a large variability in MRI imaging patterns. In literature ther is no case reported about leiomyomas spectroscopy. We report a case of 34 year-old woman who was admitted to the hospital for evaluation of an abdominal mass diagnosed at ultrasound. Physical examination revealed abdominal distension and abnormal uterine bleeding. Using abdominal MRI 3 Tesla we were able to determine the presence of a mass near uterine body very close to left ovarian. Laparotomy was performed and it showed a uterine peduncolated lesion. Histological examination proved smooth muscle cells and spindle-shaped cells separated by myxoid materials and ordinary myoma cells. This case report suggests that MR Spectroscopy may be able to allow distinction between benign and malignant lesions. It is important to differentiate leiomyomas from other diseases because of therapeutic treatment. In our case laparoscopic exeresis of the lesion permitted to preserve uterus and Patient's fertility.

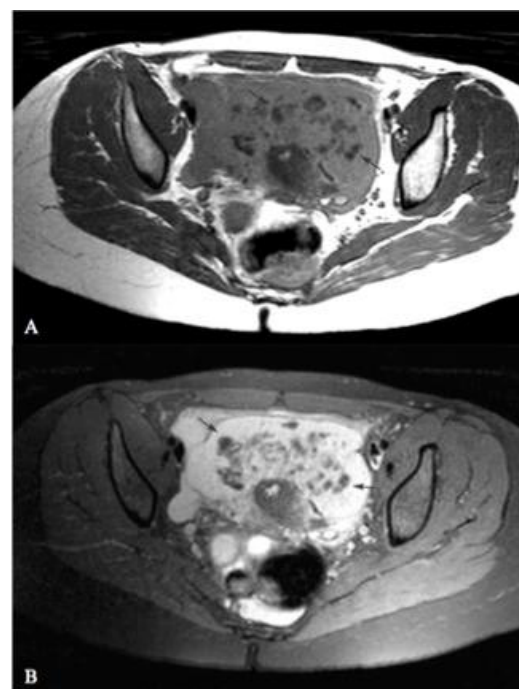
**Keywords:** MR Spectroscopy; Leiomyoma; Abdominal mass; MRI 3 Tesla

### Introduction

Leiomyoma is the most common uterine tumour. In MRI examination leiomyoma normally appeared to be hypointense relative to the surrounding myometrium on T2 weighted images and isointense on T1 weighted images. We report the unusual case of myxoid leiomyoma studied on MRI and MR Spectroscopy.

### Materials and Methods

We report the case of a 34 year-old woman, no pregnancy, who was admitted to the hospital for evaluation of an abdominal mass diagnosed by ultrasound. Physical examination revealed abdominal distension and abnormal uterine bleeding. By using trans-abdominal and endovaginal ultrasound, the study showed a solid mass of non-homogenous echostructure, of irregular shape and with cystic areas. Abdominal MRI examination at 3 Tesla (Achieva, Philips Medical System, Best, Olanda) was carried out both before and after administration of intravenous contrast medium (Gadovist, Gadobutrolo, 1.0 mmol/ml, Bayer Shering Pharma) with a multichannel phased-array coil positioned on the pelvis. To reduce intestinal peristalsis the patient received an intramuscular injection of 1 mg Butyl Scopolamine (Buscopan, Schering, Germany) 10 minutes before the beginning of the examination. Axial T1-weighted Spin Echo (SE) images were acquired with the following parameters: TR/TE 500/14 ms, slice thickness 4 mm with 1 mm interval, matrix 256×256 and Field of View (FOV) 24 cm. Axial T2-weighted Rapid Acquisition with Relaxation Enhancement (RARE) Fast Spin Echo (FSE) images were acquired with the following parameters: TR/TE 4,000/85 ms, Echo Train Length (ETL) 12, slice thickness 4 mm with 1 mm interval, matrix 256×256 and FOV 24 cm. The parameters used to obtain the sagittal and coronal T2-weighted RARE sequences were TR/TE 3,500-4,000/90 ms, ETL 12, slice thickness 3 mm with 1 mm interval, matrix 256×256 and FOV 24 cm. The examination showed a mass near the uterine body (Figure 1), with no evident relationship, and very close to the left ovary. The neoformation was enlarged to the left without any clear separation from the left ovary. This could have suggested an ovarian origin of the lesion, also considering the mainly fluid component of the mass itself. This lesion was characterized by an inhomogenous structure with solid and cystic areas in the context. On T2 weighted sequences the mass appeared inhomogeneously hyperintense relative to surrounding myometrium (Figure 2) while on T1 weighted images it was characterized by low signal intensity. Enhanced T1



**Figure 1:** Myxoid Leiomyoma in a 34 years old woman. A) axial T1 B) axial T1 SPIR - weighted MR images show a enlarged mass, closely to the left ovary (O) with irregular solid components, cystic areas and papillary projections (arrows). Myxoid material demonstrates low signal intensity in T1 weighted.

**\*Corresponding author:** Irene Coco, Department of Imaging Diagnostic, Molecular Imaging, Interventional Radiology and Radiation Therapy, University Hospital Tor Vergata, 81 Oxford street, 00133, Rome, Italy, Tel: +039-06-20-90-24-01; Fax +039-06-20-90-24-04; E-mail: [ire.coco@hotmail.it](mailto:ire.coco@hotmail.it)

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weighted images acquired after the injection of intravenous contrast medium showed intense contrast enhancement of the mass and the presence of many papillar projections into the lesion (Figure 3). MR Spectroscopy was performed and demonstrated cholina (Cho) and Creatina (Cr) low signal increase and higher Lactate increase (Figure 4). These findings were consistent with an initial diagnostic hypothesis of an ovarian origin of the lesion.

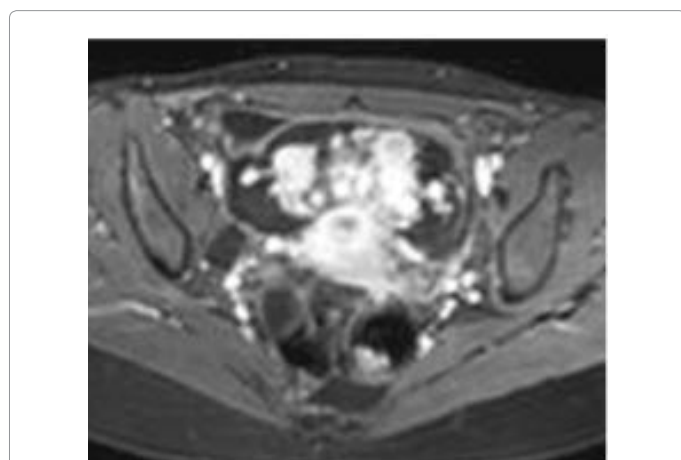
The patients underwent exploratory laparotomy that revealed the presence of a large uterine peduncolated lesion with soft and translucent surface and viscous fluid in cystic degeneration areas. Extemporaneous histological examination found a benign mass proliferation with no evidence of malignancy. A laparotomy myomectomy was performed and showed a solido-cystic tumor that weighted 1456 gram. Histological examination showed smooth muscle cells and spindle-shaped cells separated by myxoid materials and ordinary myoma cells without the presence of infiltrative margins, nuclear atypia, and increased mitotic figures suggestive of sarcomatous transformation.

## Results

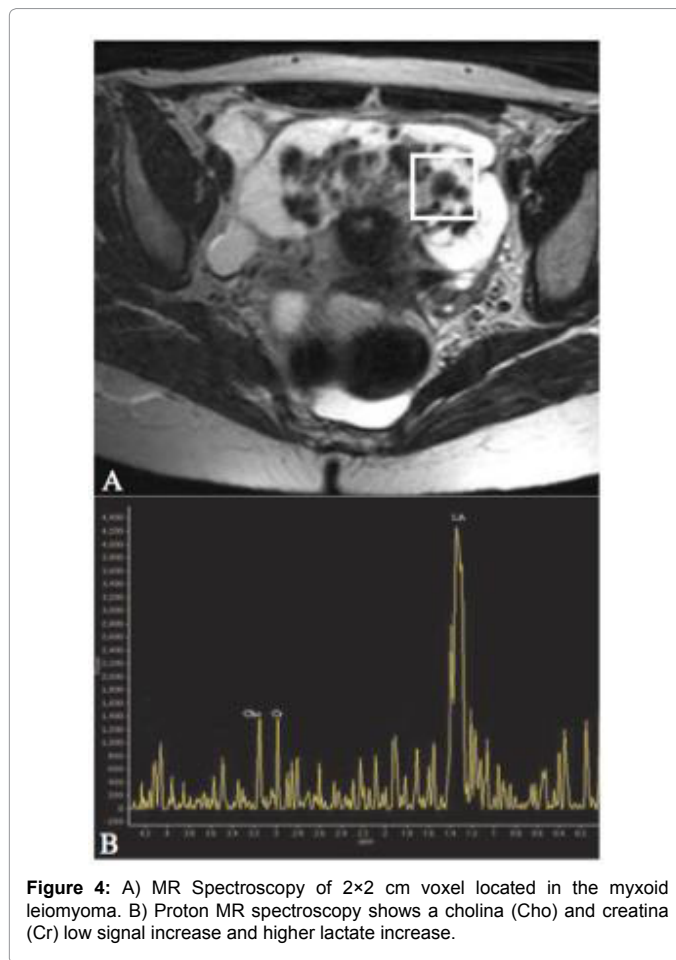
In this case, MR Spectroscopy shows a Cholina (Cho) (3.2 ppm) and Creatina (Cr) (3.0 ppm) low signal increase and a major Lactate Value (LA) (4.3 ppm). The characteristically obtained signal was



**Figure 2:** A) Axial, B) Coronal and C) Sagittal T2 weighted images show a large mass with heterogeneous high signal intensity in front of uterine body closely to the leftovary (O). Myxoid degeneration was confirmed at surgery.



**Figure 3:** Axial T2 THRIVE-DYN weighted images show an enlarged mass. Multiple hyperintense foci are embedded in the lesion. Hyperintense areas suggestive of degeneration.



**Figure 4:** A) MR Spectroscopy of 2x2 cm voxel located in the myxoid leiomyoma. B) Proton MR spectroscopy shows a cholina (Cho) and creatina (Cr) low signal increase and higher lactate increase.

Lactate, which was detected not only in all the malignant tumours but also in some of the benign tumours. However, the Lactate signals of the malignant tumours tended to form higher peaks than those of benign tumours, which was a finding consistent with the result of the earlier *in vitro* study reported in ovarian tumours. The signal of Choline-containing compounds (Cho) was found only in solid tumours, and the signal intensity varied among different histological types of tumours, possibly reflecting metabolic activity of the cell membrane [18].

Our case suggests that Cho increase could depend on membrane disruption, cell proliferation and inflammation by macrophages and Cr increase could be due to intense energetic metabolism of cells. To our knowledge LA concentration is close to the detection limit and the other metabolites (glucose, GABA, Glutamate) overlap each other and simple analysis is not easy. Therefore, the distinction between benign and malignant lesions is difficult, but we observed in this examination an important LA peak. This is probably due to microscopic inflammation in the leiomyoma. This case suggests that MR Spectroscopy may permit distinction between benign and malignant lesions and/or may provide a prognostic discrimination independent of histology. It is important to differentiate leiomyomas from other diseases, because therapeutic options include observation, medical treatments or surgery. In patients who wish to preserve fertility, hormone analogues (Gn-RH) are considered a valid alternative to hysterectomy. In this case laparoscopic exeresis of the lesion permitted the preservation of the uterus and the patient's fertility.

Prospective studies on large numbers of patients, with well-defined

types of lesion, need to be performed to determine if MR spectroscopy provides a reliable diagnosis/prognosis that correlates the clinical outcome. Our objective is to increase the study of myxoid leiomyomas using MR spectroscopy to determine which metabolisms correspond to this type of lesion and therefore permit a specific diagnosis. This result is promising: it confirmed that in other settings it could pave the way for interventional trials where the results of MR Spectroscopy could affect the choice of individual treatment for patients.

## Discussion

Uterine leiomyoma, by far the most common benign tumor of the female pelvis, may affect more than 30% of women [1]. The roles of MR imaging for patients with leiomyoma include: (a) differentiation between leiomyoma and adenomyosis, (b) tumor localization, (c) prediction of treatment outcome, and (d) monitoring after therapy [2,3]. MR imaging has, therefore, been valuable for evaluating patients with either malignant or benign uterine tumors [4].

MR imaging is well established, but in many cases diagnosis could be difficult because leiomyoma presents a large spectrum of different ways of degeneration: hyalinization is the most common and it has a 60% frequency [5]. It is associated with collagen deposit between the cellular fascicles of smooth muscle. The second type is cystic (4% of leiomyoma) when a cyst filled with fluid develops into edematous cellular centre. When there is massive hemorrhagic infarction the leiomyoma degenerates into a red lesion. This is due to obstruction of the veins at the periphery of mass. There are also other types of leiomyoma but they are very rare as lipoleiomyoma and mixoid leiomyoma [6]. Macroscopic myxoid leiomyoma appears as a soft mucoid area with cystic changes. The lesion is translucent but solid and it may mimic a leiomyosarcoma [7-9]. Its diagnosis remains histological and is very difficult to differentiate leiomyosarcoma from leiomyoma because the lack of cellular, nuclear atypia and rare mitotic features have very similar findings in both tumours [10-12]. In these lesions, smooth muscle cells are so widely separated by abundant myxoid material that mitotic and cellular count cannot be assessed precisely. In this case the histological examination diagnosed uterine leiomyoma with severe myxoid degeneration and without malignant components.

The discrimination between leiomyoma and leiomyosarcoma is very important for therapeutic options: in case of leiomyoma the treatment includes observation or medical therapy and in most cases, no treatment at all is necessary, with the expectation that they will regress at menopause, however, for those with significant symptoms, very large fibroids, or rapidly growing fibroids, a number of treatments can be considered; important factors in deciding therapy are the severity of the symptoms, associated symptoms, age, and preservation of fertility, whereas leiomyosarcoma necessitate surgery [13]. The signal intensity of leiomyoma varies depending on degeneration or cellular content. At MR imaging the myxoid leiomyoma has high signal intensity on T2 weighted images and enhances well except for small foci of mucinous lacks or clefts. Delayed and prolonged enhancement is seen because of the presence of a myxoid stroma. The differentiation between degeneration and malignant transformation was not been possible with MR imaging [14]. In fact, in this case, the mass was very complex because of the presence of intensely enhanced formations in the main lesion and the tight proximity of the ovary and the use of Spectroscopy aid to diagnose. We applied MR Spectroscopy as a new technique to add more functional and metabolic information

about pelvic mass. MR Spectroscopy can be considered a method of molecular imaging. Molecular imaging is a diagnostic method based on the observation of cells and molecular structures *in vivo* using different imaging modalities and new diagnostic and therapeutic markers [15]. MR spectroscopic imaging may be helpful for the investigation of the underlying pathophysiology of uterine leiomyomas [16] and wherever possible, MR Spectroscopy studies should provide detailed information about components of the metabolic peaks. The concentration ranges of metabolic components need to be defined in tumours, to determine if there are consistent patterns that differ from those in normal cells [17].

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