

# MRI Correlates of Intratumoral Tissue Types within Colorectal Liver Metastases: A High Resolution Fresh Ex-Vivo Radiologic Pathologic Correlation Study

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## Introduction

Radiologists have focused on the enhancement pattern of the lesions during dynamic contrast enhanced MRI (DCE MRI) to differentiate metastases from benign lesions (1, 2) with little emphasis on the value of the signal of pre contrast images. Metastases are often heterogeneous with areas of necrosis, fibrosis and different malignant cell types(3). We used high-resolution MR methods to examine the direct relationship between the complex internal MR signal of colorectal liver metastases and their microscopic tissue characteristics.

## Methods

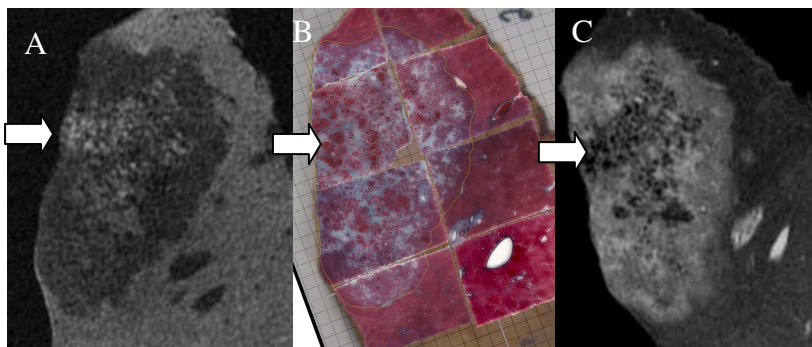
In this prospective research ethics board approved study, seven consecutive patients underwent hepatic resection for liver metastases (primary colorectal 6, breast 1- mistaken for colorectal). Within one hour after surgery, the resected fresh ex-vivo liver underwent T1 and T2 weighted MRI. MR imaging was performed on a 1.5-T system (Signa; GE Medical Systems, Milwaukee) with the head coil with a voxel size of 0.47mm x 0.7mm x 2mm for T2 and 0.47mm x 0.7mm x 0.2mm for T1. The liver was sectioned in a concordant plane and individual histologic slides were scanned and reconstructed to form a whole mount pathologic image of the metastases. The pathologist drew regions of interest (ROI) for necrosis, loose or dense fibrosis, moderate and poorly differentiated cells within the metastases. These ROI's were transferred to a corresponding MRI image. For each ROI qualitative and quantitative signal characteristics were measured. Student t test was performed to assess significance of variations in signal from the different tissue types.

## Results

A total of 103 zones were defined after pathologic analysis, 98 from the colorectal metastases. The type of necrosis was exclusively intracinar necrosis (IAN). On T2, IAN shows significant lower signal ( $p<0.05$ ) than the other tissues types. On T1, IAN showed significant higher signal ( $p<0.005$ ) than all the other tissues with the exception of dense fibrosis. Qualitatively IAN had a specific pattern of signal (mixed T2, high T1). Other tissues types showed a pattern of bright signal on T2 and low signal on T1, including fibrosis.

## Conclusion

We successfully used high resolution MRI to correlate the MR signal of colorectal liver metastases and their microscopic tissue characteristics. Intra-acinar necrosis seen in colorectal metastases exhibits high T1 signal and mixed low T2 signal. This signal pattern is unusual for common benign liver lesions and may be helpful in the MRI diagnosis colorectal liver metastases.



## Caption

Liver metastasis from a sigmoid carcinoma on T1 (A), histological slides (B), T2 (C). Typical pattern of metastases with intra-acinar necrosis (dark red), fibrosis (blue) and cells (pink). IAN exhibits high signal on T1, dark signal on T2 (arrow).

## References

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