# Accuracy of USPIO-enhanced MRI for staging of rectal cancer: a multicenter study in an expert an 3 regional centers

M. Maas[1], G. L. Beets[2], M. J. Lahaye[1], S. M. Engelen[2], J. P. Dohmen[3], G. R. Opdenakker[4], D. M. Lambregts[1], J. E. Wildberger[1], and R. G. Beets-Tan[1]

[1]Radiology, University Hospital Maastricht, Maastricht, Netherlands, [2]Surgery, University Hospital Maastricht, Maastricht, Netherlands, [3]Radiology, St. Jans Gasthuis, Weert, Netherlands, [4]Radiology, Laurentius Hospital, Roermond, Netherlands

Background:
Ultrasmall Superparamagnetic Iron Oxides (USPIO) enhanced MRI is known to have high accuracy for prediction of nodal metastases in various cancers. This prospective multicenter study evaluates the diagnostic performance of MRI for predicting T-stage and N-stage with and without USPIO in primary non-locally advanced rectal cancer and compares results for 1 expert and 3 regional centers.

Materials and Methods:
From February 2003 till October 2007, 327 rectal cancer patients were enrolled in this prospective multicenter study and received USPIO-MRI (Sinerem®), 24 hours after infusion. Sequences were axial 2D T2W FSE, 3D T1W GRE & 3DT2*. The local radiologists (non-experts) prospectively predicted the T-stage and the nodal status using a confidence level score (0 = definitely N0 to 4 = definitely N+), first on T2W, thereafter on 3DT2* . In a separate session the expert prospectively double read each MR of the regional study patients, based on which selection for the right treatment arm occurred. Reference standard was histology. Receiver operating characteristic (ROC) analysis for prediction of tumors limited to the bowel wall (pT1-2) and nodal involvement were performed.

Results:
130/327 were non-locally advanced patients and used for analysis (42/130 were regional inclusions, 42/150 were pN+). The results are given in table 1-2.

Conclusion
1. MRI can predict tumors limited to the bowel wall (pT1-2) with high PPV for expert as well as non-experts, however at the expense of overstaging errors as shown by the low NPV.
2. T2W sequences (without any effect from the USPIO) for identifying nodal disease is not sufficiently accurate for clinical decision making unless read by an expert with high NPV at the expense of a low PPV
3. The additional use of 3DT2* sequences improved the diagnostic performance for identifying involved nodes both for expert and regional radiologists to a level of accurate selection of the pN0 patients.

| pT1-2 (1.5-T) | Non-expert | Expert |
|---|---|---|
| AUC | 0.76 | 0.84 |
| Sens | 0.59 | 0.72 |
| Spec | 0.90 | 0.94 |
| PPV | 0.87 | 0.95 |
| NPV | 0.67 | 0.69 |

| Nodal Status (1.5-T) | T2W non-enhanced | | USPIO 3D T2* | |
|---|---|---|---|---|
| | Non-expert | Expert | Non-expert | Expert |
| AUC | 0.81 | 0.84 | 0.87 | 0.92 |
| Sens | 0.62 | 0.90 | 0.92 | 0.95 |
| Spec | 0.83 | 0.53 | 0.69 | 0.81 |
| PPV | 0.62 | 0.47 | 0.57 | 0.70 |
| NPV | 0.83 | 0.92 | 0.95 | 0.97 |