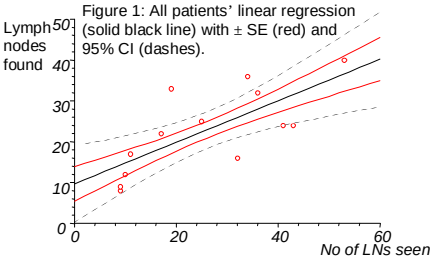
# USPIO-enhanced specimen MRI of rectal cancer: how well does it correlate with histopathology?

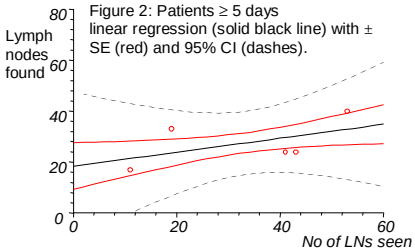
S. Rasheed[1], T. Guenther[1], I. C. Talbot[1], J. J. Stirling[2], P. J. McDonald[1], J. M. Northover[1], L. A. Culver[2], R. J. Glynne-Jones[3], A. R. Padhani[2]
[1]St. Mark's Hospital, Harrow, Middlesex, United Kingdom, [2]Paul Strickland Scanner Centre, Mount Vernon Hospital, Northwood, Middlesex, United Kingdom, [3]Mount Vernon Hospital, Northwood, Middlesex, United Kingdom

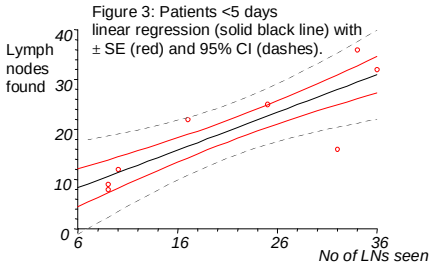
**Introduction:** Accurate detection of lymph node metastases is important for the optimal management of rectal cancer patients. Ultrasmall superparamagnetic iron oxide (USPIO) contrast enhanced MRI has emerged as an effective method of assessing lymph node involvement in pelvic malignancy[1,2] but clinical data is generally lacking for rectal cancers. Total mesorectal excision (TME) surgery involves removal of the rectum and mesorectum containing the mesorectal lymph nodes (LNs) *en bloc* and the application of this surgical technique allows for the accurate correlation of specimen MRI and histopathology[3]. Initial characterisation of LN appearance on mesorectal specimen MR has been performed comparing findings with histopathological assessment[4]. Here we investigate the correlation between lymph nodes seen on specimen MRI and those found at histopathology. We also investigated the optimum time interval between contrast injection and surgery in USPIO lymphography of mesorectal lymph nodes.

**Methods:** 13 patients (median age 66 years old; range 39-81) with histologically confirmed primary rectal adenocarcinoma not receiving preoperative therapy underwent pre- and post-USPIO contrast enhanced MRI. Patients were studied with high resolution FSE T2-weighted and GRE T2*-weighted sequences before and 24 hours after intravenous infusion of the USPIO contrast agent (Sinerem®, Laboratoire Guerbet, France); dose 2.6mg Fe/kg. TME surgery was followed by fixed specimen MRI using the same sequences in order to obtain precise histological correlations. Specimen MRIs were analysed, noting the size, position and appearance of LNs classifying nodes according to the scheme of Koh et al[4]. Each node identified on the specimen was harvested and evaluated pathologically. A comparison was made of LNs seen on specimen MRI and found at pathology for studies performed <5 days and ≥5 days prior to surgery.

**Results:** The time interval between USPIO infusion and surgery was a mean of 3.8 days (range 2-6 days). A total of 336 lymph nodes were seen on specimen MRI. No differences were noted in the number of LNs seen in patients in the <5 day group (n=8) and ≥5 day group (n=5) (p=0.12). 5/8 specimens were assessed as node positve for malignancy at <5 days and all five specimens ≥5 days were assessed as positive. There were no differences in the proportion of small (<5mm) nodes seen in the two groups (p=0.21). A total of 298 nodes were found at histopathology including 287 benign and 11 malignant nodes. There were no differences in the numbers of nodes found in the two groups (p=0.21), although the three LN positive specimens were all in the <5 day group. The numbers of histolopathological LNs found correlated well with those seen on specimen MRI; a significant correlation for all 13 patients was seen (r= 0.73; p=0.005) (figure 1). The correlation was better for the <5 day group (r=0.84; p=0.01) than for the ≥5 day group (r=0.54; p=0.35) - figures 2, 3.




In the <5 day group, we correctly classified 6/8 specimens (including all 3 specimens containing malignant nodes). In the ≥5 day group, we incorrectly classified all five specimens. In the two incorrectly classified specimens in the <5day group, we mis-classified 1 node as malignant in each patient. One of these was a 4mm node which appeared to be malignant was in fact a reactive node with follicular hyperplasia. On re-evaluation of the specimen MRI, there did appear to be a very small area of USPIO uptake at the centre of the node, consistent with the previously described appeareance of a reactive node[4]. In the other incorrectly classified specimen, an 8mm heterogeneous node appeared to be malignant but histopathological examination revealed it to be benign; even after reassessment, the heterogeneous appeareance still suggests malignancy. In the patients in the ≥5day group, 4 specimen nodes were incorrectly assigned because no USPIO was present in the nodes on MRI (all false positives) and 1 patient had a node which was fibrotic on pathology.

**Discussion:** USPIO contrast enhanced specimen MRI is a useful tool in assessing the number and nature mesorectal lymph nodes in rectal cancer patients. Here we demonstrate good correlation between nodes seen on specimen MRI and those found at histopathology. We also show that fewer errors occur in the assessment of specimen MRI when the time interval between contrast injection and surgery is less than 5 days and we highlight pitfalls in USPIO lymphography of mesorectal lymph nodes which include reactive and fibrotic nodes that do not take up USPIO contrast in a uniform manner.

**References**

[1]Bellin MF, *Radiology* 1998; 207:799-808. [2]Harisinghani MG, *AJR* 1999; 172:1347-51. [3]Brown G, *Radiology* 1999; 211:215-22. [4]Koh DM, *Radiology* 2004; 231:91-9.