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**Solving Gordic's node: Dedicated LN imaging**

- > Type of study: Clinical applications study
- > Main target of study: Patient handling
- > Organ/Tissue: male GU
- > Pathology: tumors
- > Methods: not focused on special method

Pre-operative detection of lymph node metastases is critical for the choice of pre-operative chemo-radiotherapy, surgical treatment, and patient prognosis. Unfortunately, conventional imaging techniques like multi detector CT or MRI can only assess nodal size and shape, which results in a very low sensitivity in detecting metastases. A meta-analysis of a total of 19 studies showed that MDCT and MRI demonstrate an equally poor performance in the detection of lymph node metastases from prostate cancer. Reliance on either CT or MRI will misrepresent the patient's true status regarding nodal metastases and thus misdirect the therapeutic strategies offered to the patient. For conventional CT pooled sensitivity of 42% and pooled specificity were 42% and 82% respectively. For MRI, these values were 39% and 82%. Therefore, these techniques have limited value in the detection of nodal metastases.

PET/CT is limited by the amount and activity of the specific tracer within pathologic nodes. For most pelvic tumors this technique has limitations, and metastatic nodes do need to have a rather large size, before being positive. "Contamination" of the excreted tracer within the urinary bladder further limits this technique. Pelvic Lymph Node Dissection has limited surgical coverage, thus new techniques are needed to evaluate lymph nodes.

Ultrasmall super paramagnetic iron oxide (USPIO) enhanced magnetic resonance imaging (MRI) is now being used as a potential biomarker for the detection of lymph node metastases. USPIO is transported into the interstitial space and reaches the lymph nodes via the lymphatic circulation acting as a 'negative contrast' agent, which can potentially identify metastases independent of lymph node size. We assessed here the diagnostic precision and application of magnetic resonance imaging (MRI) in conjunction with USPIO contrast as a biomarker for detecting LNMs preoperatively, compared with the gold-standard post-operative histopathology. A total of 19 prospective studies have been published between 1994 and 2005, comprising 3,004 lymph nodes in 631 patients who underwent comparable MR imaging with and without USPIO. The overall sensitivity and specificity for MRI with USPIO were 88% and 96% respectively, with an area under the ROC curve of 84% and a diagnostic odds ratio of 123. When unenhanced MRI was evaluated, there was a significant reduction in the overall sensitivity and specificity (63% and 93% respectively) and a diagnostic odds ratio of 27. USPIO-enhanced MRI had a higher sensitivity and specificity for lymph node status in the abdomen and pelvis compared with the chest or head and neck. Similarly, the diagnostic precision was better when a 1.5T MRI scanner was used at 2.6 mg/kg contrast dose, or when using a 3T field strength. Thus, USPIO is a promising nanomarker, which may potentially increase the precision for the pre-operative diagnosis of lymph node metastases. It may be used for providing guidelines for selecting patients for targeted neo adjuvant chemotherapy and extended lymphadenectomy thus possibly reducing the incidence of local recurrence.

**Abstract**

In this course the value of conventional and novel techniques in detecting small nodal metastases will be presented. Pre-operative detection of lymph node metastases is critical for the choice of pre-operative chemo-radiotherapy, surgical treatment, and patient prognosis. Unfortunately, conventional imaging techniques like multi detector CT or MRI can only assess nodal size and shape, which results in a very low sensitivity in detecting metastases. Ultrasmall super paramagnetic iron oxide is a promising MR-nanomarker, which potentially increases the precision for the pre-operative diagnosis of lymph node metastases. It can be used for providing guidelines for selecting patients for targeted neo adjuvant chemotherapy and extended lymphadenectomy thus possibly reducing the incidence of local recurrence.

