Sentinel node biopsy in prostate and bladder cancer using magnetic nanoparticles and a new magnetic detection technique

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Background

Patients with a prostate or bladder tumour, without metastases on PET-CT, can still have occult metastases in local lymph nodes. Therefore, a pelvic lymph node dissection is currently performed in patients with increased risk of metastases. [1] Known disadvantages of this procedure are over-treatment (60-96% [2]), missed lymph nodes during resection and missed metastases during histopathological analysis. A sentinel node biopsy (SNB) procedure can potentially overcome these drawbacks. In the current SNB procedure a radioactive tracer is used. However, the use of this tracer is associated with strict rules and regulations, hampering availability for many hospitals. Recently a radiation-free alternative, Sienna+® (Endomag Ltd, UK), a superparamagnetic iron oxide tracer, was developed in combination with the Sentimag® detector for human use. [3] This device has two crucial downsides: First, it is impossible to use the device in combination with metal instruments. Second, it is not only sensitive to magnetic tracer but also to the diamagnetic human tissue which limits the sensitivity and requires time-consuming balancing. A new magnetic measurement technique (DiffMAG) was developed by our group and incorporated in a prototype to overcome these drawbacks.

Study design

Twenty patients with a primary prostate or bladder tumour will be included. One day before surgery, Sienna+® will be injected around the tumour under ultrasound guidance, followed by an MRI-scan to pre-operatively localise the draining SNs. After resection of the tumour and lymph nodes, first the DiffMag probe will be used for *ex vivo* detection of the SN, followed by the Sentimag. The results of both devices will be compared, in order to validate the new DiffMAG technique. This research aims to prove the efficacy of the DiffMAG technique and the benefit of the SN procedure for prostate and bladder cancer patients.

References

[1] Briganti et al., 2012

[2] Heidenreich et al., 2002

[3] Winter et al., 2014