The Use of TraceIT® as a Fiducial Marker in Bladder Radiotherapy

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Introduction

Accurate localization for radiation therapy to bladder malignancies is a challenge due to uncertainty in daily variation of bladder volume. This uncertainty can pose a significant risk in accurately identifying the tumour target volume which in turn can impact on radiation damage to surrounding healthy tissues.

Lipiodol has been used as a fiducial marker in the treatment of bladder cancer. However, injection of Lipiodol as discrete fiducial markers into the bladder submucosa can be technically difficult. In addition, diffusion of Lipiodol into the submucosa can make it difficult to clearly identify the markers on CBCT images (Fig. 1).

Results

The patient tolerated the TraceIT® injection procedure well with no adverse event reported. With a similar density value to tissue of 1.02g/cm³ and owing to its radiopaque property, TraceIT® blebs were clearly visible on CT images without any artefacts. This further enabled easy delineation and contouring of TraceIT® blebs for planning and verification images.

Background and Objectives

Recently, TraceIT® Tissue Marker has attracted more interest as an alternative soft tissue fiducial marker for the bladder wall. TraceIT® Tissue Marker is an absorbable radiopaque hydrogel consisting of iodinated polyethylene glycol (PEG) hydrogel particles in a viscous carrier (Fig. 2). The PEG iodination property enables TraceIT® to be visible on both CT and CBCT without any artefacts; the high water content allows the gel to be visible on MRI and Ultrasound. Following injection into the bladder wall, the hydrogel particles form a “bleb” that remains in-situ and visible for 3 months. These “blebs” then hydrolyse, which causes them to liquefy, be re-absorbed and cleared from the body via renal filtration after 7 months.

Method and Materials

84 year old male presented with a newly diagnosed unilateral invasive high grade transitional cell carcinoma (TCC) of his posterior bladder wall with a past history of prostate cancer treated more than 5 years ago with iodine-125 low dose rate (LDR) brachytherapy. His PSA was now <0.1ng/ml.

In this case study, we evaluated:
• The safety of TraceIT®
• The suitability of TraceIT® as a stable fiducial marker in the treatment of bladder cancer

CT planning for bladder IMRT was performed 5 days post procedure. The patient was catheterised at CT. The bladder was drained of urine then refilled with 240ml of saline to displace the tumour bed away from the previously irradiated prostate. Dose prescribed was 64.00Gy in 2.0 Gy per fraction.

Conclusion

In our experience, TraceIT® was found to be straightforward to inject cystoscopically into the bladder submucosa with no reported post operative complications.

TraceIT® blebs remained stable throughout the entire course of treatment and there were no issues reported with identifying and matching TraceIT® blebs on CBCT images.

TraceIT® can be considered as a feasible option to clearly demarcate the exact tumour location and margins to facilitate the delivery of targeted focal bladder IMRT.

References