ABSTRACT SUBMISSION FORM
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- Oral presentation preferred
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Trainee status
- I am a trainee (student or postdoctoral fellow)
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PRESENTATION TITLE
MR, CT and Cone-Beam CT for metastatic lymph node visualisation in lung cancer patients

AUTHOR(S)
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ABSTRACT

**Purpose** A potential benefit of MR-image guided radiotherapy in lung cancer is the on-board visualisation of metastatic lymph nodes. In this work we wanted to assess whether MR would aid in defining boundaries of metastatic lymph nodes with the intention to contour. We hypothesised MR would outperform CT and Cone-Beam-CT (CBCT) in this area.

**Methods** CT, CBCT and MR images were acquired in 4 lung cancer patients with confirmed metastatic lymph nodes (determined from standard lung cancer work-up PET-CT, EBUS or both). The metastatic lymph nodes imaged included: 2R(x1), 3P(x1), 4R(x1), 4L(x1), 5(x3), 6(x1), 7(x3), 10L(x3) and 11R(x1). The imaging datasets included: 1). CT planning scan, 2). MR 1 – acquired within 1 week of CT, 3). CBCT – during radiotherapy treatment, 4). MR 2 – same day as CBCT.

A 1.5T MRI scanner (MAGNETOM Aera; Siemens Healthcare, Erlangen, Germany) was used with flat table top, spine coil and anterior flex coil on support. The MR sequences included a navigator triggered Turbo Spin Echo (TSE), navigator triggered TSE with fat sat and 3D radial gradient echo (GE) with fat sat.

The image datasets were randomised and two observers (consultant clinical oncologist (DC) and research fellow (SB)) independently scored the images according to the research question: “Can the metastatic lymph nodes be visualised well enough for contouring?” Images were scored as: 1 – not visible, 2 – unclear, 3 – clear, 4 – very clear at each nodal station. Scores were then divided into two sets: ‘not suitable for contouring’, (scores 1 or 2), and ‘suitable for contouring’, (scores 3 or 4). A chi-squared test was used for significance testing.

**Results** Figure 1 shows image datasets at the level of the right hilar region in a patient with T3N2M0 disease.
No significant difference was found between CT and MR for contouring metastatic lymph nodes. A significantly greater number of metastatic lymph nodes were deemed suitable for contouring on MR 2 compared to CBCT (p<0.05). This is illustrated by figure 2 for the two observers.

**Figure 2.** lymph nodes deemed acceptable for contouring across the imaging datasets for two observers.

**Conclusion** The percentage of metastatic nodes deemed suitable for contouring was 90% (MR), 87% (CT) and 17% (CBCT). MR did not significantly out-perform CT. This could be due to greater observer experience with CT. MR was deemed to be significantly better than CBCT, which is likely due to the superior soft tissue contrast of MR. This supports the use of MR guided radiotherapy in patients with malignant lymphadenopathy for adaptive planning or treatment verification. Differences in lymph node visibility across MR sequences was also noted, though not consistent between the two observers, highlighting the need for additional training in MR interpretation. Future work will involve assessing the localisation of the lymph nodes by observers on a larger dataset.