Heterogeneous FDG-guided dose-escalation for locally advanced NSCLC (the NARLAL2 trial): Design and early dosimetric results of a randomized, multi-centre phase-III study - DTU Orbit (01/05/2019)

Background and purpose: Local recurrence is frequent in locally advanced NSCLC and is primarily located in FDG-avid parts of tumour and lymph nodes. Aiming at improving local control without increasing toxicity, we designed a multi-centre phase-III trial delivering inhomogeneous dose-escalation driven by FDG-avid volumes, while respecting normal tissue constraints and requiring no increase in mean lung dose. Dose-escalation driven by FDG-avid volumes, delivering mean doses of 95 Gy (tumour) and 74 Gy (lymph nodes), was pursued and compared to standard 66 Gy/33 F plans.

Material and methods: Dose plans for the first thirty patients enrolled were analysed. Standard and escalated plans were created for all patients, blinded to randomization, and compared for each patient in terms of the ability to escalate while protecting normal tissue.

Results: The median dose-escalation in FDG-avid areas was 93.9 Gy (tumour) and 73.0 Gy (lymph nodes). Escalation drove the GTV and CTV to mean doses for the tumour of 87.5 Gy (GTV-T) and 81.3 Gy (CTV-T) in median. No significant differences in mean dose to lung and heart between standard and escalated were found, but small volumes of e.g. the bronchi received doses between 66 and 74 Gy due to escalation.

Conclusions: FDG-driven inhomogeneous dose-escalation achieves large increment in tumour and lymph node dose, while delivering similar doses to normal tissue as homogenous standard plans.