



SCHOOL

ESTRO Mobility Grant Report:

First clinical implementation of an MR-linac in Spain

Host institute: The Royal Marsden Hospital, London, UK

Date of visit: 2-13 December 2019

The recent availability of magnetic resonance-guided radiotherapy (MRgRT) in clinical practice has provided superior soft-tissue contrast and biological information that can help us to optimise positioning accuracy and precision of treatment. Its use opens a new field in our clinical practice, as we can potentially use biological information to indicate a treatment response to modify the treatment.

A few months ago, my hospital acquired an MR-linac (Elekta Unity®), which comprises a 1.5T Philips magnetic resonance imaging (MRI) scanner and an Elekta 6MV accelerator. Before we start clinical activity with this machine, I am gaining knowledge in the field of MRgRT. With the mobility grant offered by the European Society for Radiotherapy and Oncology (ESTRO), I have been able to visit The Royal Marsden Hospital, one of the seven original members of the MRI-Linear Accelerator Consortium. This group, which was created in 2012 and was formed originally by seven international centres in collaboration with Philips and Elekta, seeks the implementation and clinical introduction of MR-linacs.



Image 1: The MR-linac Elekta Unity® at The Royal Marsden Hospital

With the help of Dr Allison Tree and all the prostate team, I learned about all the aspects of clinical workflow regarding use of the MR-linac to treat a prostate patient. In the first consultation, the team investigated whether the patient was eligible for the study entitled 'Prostate Radiotherapy Integrated With Simultaneous MRI (The PRISM Study)' (NCT03658525). If the patient was eligible, a planning CT scan was produced, alongside MR imaging in the MR-linac. Afterwards, the team contoured the treatment volumes and the organs at risk (special thanks to Professor Dearnaley), and calculated the dose prescription (48.6Gy to the prostate and 2cm of the seminal vesicles (SVs), and 60Gy to the prostate and 1cm of SVs). After approval of the dosimetry, the patient was called for the first treatment session.



Image 2: Control room of the MR-linac

Every day, radiographers checked whether the patient was MR compatible. Then, the patient was positioned. There were usually three radiographers, two physicists and one radiation oncologist present. The radiographers first acquired a MR T2 sequence. The next step was to adapt the plan through use of a workflow system called adapt to shape (ATS). This procedure consisted first of fusion of the CT planning and MR images, then contouring of the treatment volumes and checking of the propagation of the organs at risk by the physician. The next step was calculation of the dosimetry, performed by the physicists on a CT-like image made from the MR images, and based on the original dosimetry. Finally, if the dosimetry was correct, the patient was prepared for the treatment delivery. During the delivery, live MR imaging was acquired (axial, coronal and sagittal planes), so that the staff could check whether treatment volumes suffered any substantial changes.

I would like to express my gratitude to all the MR-linac team of The Royal Marsden (physicians, physicists, radiographers) for this wonderful experience. Through this brief but intense visit I have learned some essential aspects of MRgRT, which will be very useful to start clinical activity in my centre.



Luis Fuertes
Radiation oncologist
La Paz University Hospital
Madrid, Spain
lfuertes.1@gmail.com

References:

1. Lagendijk JJ, Raaymakers BW, van Vulpen M. The magnetic resonance imaging-linac system. *Semin Radiat Oncol.* 2014;24(3):207–209. doi:10.1016/j.semradonc.2014.02.009
2. Kerkmeijer LG, Fuller CD, Verkooijen HM et al. The MRI-Linear Accelerator Consortium: Evidence-Based Clinical Introduction of an Innovation in Radiation Oncology Connecting Researchers, Methodology, Data Collection, Quality Assurance, and Technical Development. *Front Oncol.* 2016;6:215. Published 2016 Oct 13. doi:10.3389/fonc.2016.00215

