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Editorial

Single-fraction magnetic resonance guided stereotactic radiotherapy – A game changer?

Not only in times of the corona virus disease but also due to patient preference and comfort as well as better utilization of advanced radiotherapy (RT) technology, hypofractionation has become an important issue: less fractions mean less appointments in person, but it also means more comfort for patients and potentially more efficient machine usage. Single-fraction delivery is the most extreme way to fractionate; however, history of radiation oncology has widely demonstrated the radiobiological advantage of fractionation in the context of late toxicity, something part of 'Radiobiology 101' teaching [1–3]. On the other hand, surgeons deliver 'single-fraction' treatment and if radiation can be directed well enough to the target, the need for many fractions may be reduced. This makes radiotherapy an attractive alternative to surgery, at least for medically inoperable patients. However, one of the most important aspects of high accuracy targeting is the visualisation of the target and image guidance is the essential ingredient for a safe realization of single-fraction stereotactic ablative RT (SABR) [4–6].

The paper by Finazzi et al. [7] published in this issue of our journal takes this idea to the logical conclusion by employing the most advanced method of image-guidance, magnetic resonance imaging (MRI), for single-fraction radiation delivery. MRI combined with accelerator based radiation delivery is an exciting new technology which is challenging from many perspectives; technology, training, workflow and resource considerations are just some of them [8–10]. Without doubt, single-fraction delivery addresses at least the last point very effectively. However, the long treatment time required for current MRI-linac delivery systems is a challenge and in the present study one of ten patients was not able to complete single-fraction treatment. This is well acknowledged and discussed in the paper [7]. On the other hand it is encouraging that good performance status was not essential for consideration of stereotactic MRI-guided adaptive RT (SMART) treatment. This is an important factor as medically inoperable patients would – in any case initially – be a significant proportion of the patients for consideration.

Long treatment times are very likely 'teething' problems of a new technology and it is highly likely that future treatments will be faster. Also the mid-treatment adaptation used in the present study may fall by the wayside as the authors also suggest that its impact on gross tumour volume coverage has been small. If this is still the case when smaller target volume margins are used will be an interesting research question for the future. In any case, it appears that the dose distributions achievable with MRI-linacs are as suitable for SABR as with conventional linacs, as recently demonstrated by den Hartogh et al. for prostate SABR [11].

The paper by Finazzi et al. demonstrates that SMART can be done [7]. However, as the authors acknowledge there are also other methods of single-fraction SABR delivery which are likely to be faster and cheaper [5,12,13]. No doubt MRI-guidance is exciting and it is a great achievement to demonstrate that it can be employed for single-fraction stereotactic delivery; however, the key question will be where is it likely to make a significant difference to clinical management, be it through reduced toxicity or new indications. Lung lesions may not turn out to be the most relevant target in this context as also other imaging modalities provide adequate visualisation [14–16]. However, as SABR indications grow so do the difficulties for image-guidance and the proof of principle shown in the present paper will very likely be quickly extended to liver, pancreas and other abdominal targets where high-quality image-guidance will be highly beneficial.

Conflict of interests statement

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

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