significant differences in results. Three studies have indicated no differences in in-vitro cell survival curves between standard and flattening filter free irradiations for a range of different cancer cell lines. One of the studied differences, we present at high doses. In this presentation the potential radiobiological implications of Flattening Filter Free treatments will be explored and the current literature reviewed.

SP-0402
Uncertainties and warning with flattening filter free beams
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FFF beams are now available on medical accelerators for clinical use. Without flattening filter, the dose profiles are very different from FFF beams are now available on medical accelerators for clinical use. Without flattening filter, the dose profiles are very different from FFF beams. However, the filtered beams are used on the basis of geometric and dosimetric tolerances which have now to be redefined for these new FFF beams.

The tolerances come from a compromise between what is technically feasible and what is clinically acceptable. 2% or 2mm are, for example, values that are easily translated to the effects on the dose profile and clinical irradiations. With FFF beams, amplitude profile differences no longer allow the same physical analysis and the impact of physical variations, necessarily modulated, are not directly understandable.

It is essential in each radiotherapy center, to drive an investigation on geometric and dosimetric tolerances which have now to be redefined for these new FFF beams. Several coils provide manipulation of the electron beam before the target. All these elements may vary during voluntary adjustments or drifts (age, breakdowns). However, possible variations are limited by the computers. Some interlocks protect from unacceptable drift. Thus, the tolerances must at least be evaluated within these variations accepted by the manufacturer.

To obtain tolerances, it is first necessary to assess physically the consequences of setting changes on profiles. Then, their impact on clinical irradiations have to be analyzed. When a dosimetric variation appear unacceptable, the corresponding beam variation help to define the tolerable limit.

Conclusion: The technical evolutions of irradiations leads to important modulations with high dose rates for small targets. It is essential to establish, in each center, all geometric and dosimetric tolerances related to the use of FFF beams.

SYMPOSIUM: THE GENERATION OF NEW IMAGING MODALITIES: NEW PERSPECTIVES

SP-0403
The role of Imaging in the fight against cancer
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Individualized medicine requires techniques that enable visualisation, quantification and detection of the series of disease processes in a non-invasive way in individual patients. Medical imaging is intuitively very suitable for this purpose. Over the past decades, medical imaging has progressed in four distinct ways allowing quantitative imaging: innovations in medical devices (hardware), innovations in imaging agents, standardisation and integration protocols, and innovations in imaging analysis. By these we have witnessed medical imaging in clinical oncology evolving from a primarily diagnostic tool to a theragnostic tool by a multitude of techniques involved in the treatment and characterisation of tumours and normal organs and tissues. This information evolves from a primarily diagnostic tool to a theragnostic tool by a multitude of techniques involved in the treatment and characterisation of tumours and normal organs and tissues. Radiation oncology relies heavily on imaging. Computed tomography (CT), positron emission tomography (PET), and magnetic resonance imaging (MRI) are routinely used, mainly for dose calculation (CT) and image (PET and MRI).

However, much more can be gained by incorporating functional and molecular imaging in the processes of radiation oncology. First, imaging can play a major role in identifying interpatient differences by assessing the tumour phenotype. An example of this is Radiomics, a research field where the imaging data is converted in minable data thereby quantifying the tumour phenotype. This information cannot only be used to select patient specific treatment, but also select for further imaging techniques, e.g. hypoxia imaging or drug uptake imaging. Secondly, imaging plays a role by assessing intra-tumour and intra-organ heterogeneity. Additional radiation dose must be delivered to those parts of the tumour that need it the most, e.g. because of increased biologic treatment resistance or reduced therapeutic drug uptake, and away from regions inside the lung that are most prone to complication. In this presentation we will focus on our work in these areas, on extracting more meaningful information from medical imaging, in the context of personalized medicine.

SP-0404
Emerging possibilities with high field MRI
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Magnetic resonance imaging (MRI) offers the potential for better tumour localisation, staging and monitoring therapy response compared to X-ray CT, due primarily to its inherently superior soft-tissue contrast resolution. However, problems persist with the exclusive use of conventional MRI techniques in therapy planning in many body areas, while technical factors (such as image geometric distortion and artefacts) also pose problems. As MRI technology continues to evolve, advances such as higher magnetic field strength systems, phased array detector coils allowing for fast image acquisitions, and multi-transmit technology, are improving the quality and robustness of several existing and novel MRI techniques, which will impact on radiotherapy planning and follow-up monitoring.

In addition to conventional high resolution T1/T2 weighted imaging, the functional techniques of diffusion weighted imaging (DWI), whole-body DWI, dynamic contrast enhanced (DCE), dynamic susceptibility contrast (DSC) and spectroscopic imaging have all benefited from the increased signal arising from high field MRI systems, while emerging techniques such as phosphorous spectroscopy and sodium imaging also show considerable potential. This talk will give a brief overview of MRI before delving into current high field MRI technology, explaining how these developments benefit both anatomical and functional MR imaging techniques.

SP-0405
Dual energy CT
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With the evolution of new detector technologies and dual source CT scanners, dual energy CT examinations have become a clinical reality. The information of different X-ray spectra can be used to differentiate materials based on their specific absorptions. This approach can be clinically used to depict and to quantify iodine contrast agents. Moreover, postprocessing allows that beside normal appearing CT images (120 kVp equivalent) also virtual non-contrast images can be reconstructed, which helps to decrease the radiation exposure for multiphasic examinations because the pre-contrast scan can be omitted. Also reading 80 kVp images can add information because vessels or hypervascularized parenchymal lesions usually depict with much higher contrast.

The lecture aims to introduce the basic principle of dual source dual energy applications in oncological patients. Moreover, clinical examples and results from the literature are presented with a focus on abdominal pathologies.

Suggested Reading: