determine the treatment outcome. In this context, central questions in clinical particle radiobiology focus on the validation of RBE models, on the decipherment of underlying mechanisms, and on the question if a differential RBE between tumor and normal tissues exist.

The presentation will summarize the present knowledge of normal tissue effects after particle therapy with special emphasis on the RBE and its dependencies on physical and biological factors, on examples how RBEs for normal tissues are determined in preclinical models and from patient data as well as on needs of future investigations.

SP-0220
Novel radiation responses in normal tissue stem cells ñ Andante project
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There is growing evidence that the presence of stem cells is an important determinant for treatment outcome, not only for normal tissues but also tumours. Tissue/cancer stem cells are considered to be a main driver for tissue tolerance and regeneration and tumour growth, therapy resistance and relapse of disease. Recent developments in the field of adult stem cell technology have provided the possibilities of the 3D culture of multiple tissues and tumours as stem cell derived/containing spheres and organoids. These organoids closely resemble the composition of an organ or tumour and upon transplantation regrow the tissue and tumour closely resembling the original. Moreover, it has been suggested that adult stem are a critical target for radiation carcinogenesis. Stem cells are able to self-renew in tissues for a long period of time, which increases their lifetime risk of accumulating mutations required for cancer formation. Now using organoid cultures of salivary gland and thyroid gland we are able to study the radiation response of tissue and cancer stem cells in vitro. Examples of the response of spheres and organoids to X-rays, Carbon ions and Neutrons will be shown. Remaining cultures of salivary gland and thyroid gland we are able to determine the treatment outcome. In this context, central questions in clinical particle radiobiology focus on the validation of RBE models, on the decipherment of underlying mechanisms, and on the question if a differential RBE between tumor and normal tissues exist.

The presentation will summarize the present knowledge of normal tissue effects after particle therapy with special emphasis on the RBE and its dependencies on physical and biological factors, on examples how RBEs for normal tissues are determined in preclinical models and from patient data as well as on needs of future investigations.

SP-0221
EGFR-inhibitors, radiotherapy and normal tissue toxicity
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EGFR-inhibitors have been used in several clinical settings during the last decade and side-effects related to normal tissues like the skin, mucosa and kidney has been well described. However, when EGFR-inhibitors are combined with radiotherapy, then different skin and mucosa toxicity profiles can be seen. The presentation will focus on typical as well as atypical clinical presentations of the combined treatment modalities in skin and mucosa. This will be with an emphasis on recent data from a randomized phase III trial on chemoradiation plus/minus EGFR-inhibition. The clinical presentations will be explained with references to the current knowledge of the biology of skin toxicity.

Treatment options for acute side-effects in skin and mucosa after bio-radiotherapy is rarely causal. A few attempts have been done; some of them aiming to rephosphorylate the EGF-receptor in the skin with vitamin K3. The talk will discuss the available data from these studies. Across several tumour sites and for different EGFR-inhibitors, a correlation between skin toxicity and tumour response has also been documented. The reason for this correlation is not obvious but probably related to genetic alterations or certain genetic variations that are shared between tumour and normal tissue like skin and mucosa. At present, it is not possible to predict which patients that will develop severe skin toxicity and thereby potentially benefit from EGFR-inhibition in terms of tumour response. However, emerging data suggests that certain single nucleotide polymorphisms in the EGF-gene that alter the ligand-receptor binding might be responsible for the observed clinical correlation. These data will be discussed in the light of EGFR-inhibition in combination with chemotherapy and/or radiotherapy.

Symposium: Role of brachytherapy and contact X-ray in the treatment of rectal cancer

SP-0222
Role of endoluminal brachytherapy for rectal cancer: current status and challenges
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Clinical applications: High dose rate endorectal brachytherapy (HDREBT) is a highly targeted radiation modality that uses Magnetic Resonance Imaging (MRI) for target definition and computed tomography (CT) based treatment planning. The treatment is given on an outpatient basis and does not require anesthesia but conscious sedation as needed. In the era of Total Mesorectal Excision (TME) surgery, pre-operative external beam radiation therapy (EBRT) contributes by reducing the local recurrence from 11 to 5%. HDREBT was tested and validated clinically as an effective neoadjuvant modality for tumor down-staging in patients with operable rectal cancer having an advantage over the EBRT in providing limited normal tissues exposure to radiation. In patients unfitted for surgery, HDREBT was used as a boost after an initial course of external beam therapy to improve local control.

Technical applications: Pre-treatment includes imaging with pelvic MRI and tumor mapping with radio-opaque clips to improve the accuracy of treatment delivery. The patient is planned at the CT-simulator in supine position after bowel preparation with the Oncosmart intracavitary mold applicator (Elekta). Position of the applicator is adjusted to the level of the radio-opaque clips, as seen on the pilot, prior to CT scanning. Subsequently, the CTV contouring is performed based on MRI images. In the pre-operative setting, dose distribution is optimized in order for the target to receive 26 Gy in 4 fractions. In the boost setting, a repeated pelvic MRI is obtained 2-3 weeks after the external beam radiation treatment, period that allows tumor down-sizing, and the total dose 30 Gy is given weekly in 3 fractions. For this treatment the same applicator is used with tungsten shielding rod placed in the central applicator hole to protect the contralateral healthy tissue. Dose is optimized on the residual tumor gross tumor volume (GTV) with the addition of