

will be missed using MVCT for delineation. The delineation power is good enough in delineating many of the tumours.

2018

POSTER

### Three-Dimensional Imaging for Radiotherapy Planning in Prostate Cancer

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**Background:** The preparation of external beam 3D Conformal Radiotherapy (3DRT) and Intensity Modulated Radiotherapy (IMRT) for prostate cancer entails carrying out a CT Scan and outlining the treatment volumes and organs at risk on each of the CT scan slices. Whilst this is explained in detail to patients before starting RT during the consenting process, quite often, patients find difficult to fully understand how RT is planned and delivered.

**Material and Methods:** The 3 dimension (3D) VERT imaging system (VERTUAL Ltd, U. K.) was used in this pilot study. Local ethical approval was obtained prior to starting this project and 50 patients were included. Patients were informed of the study and asked to sign an informed consent form. RT planning CT Scans were transferred into DICOM to the VERT system. Patients were shown their own CT Scan planning images in 3D and taken through the different stages of RT planning and delivery. Patients were then asked to fill in a questionnaire in order to obtain their feedback and how the whole exercise could be improved.

**Results:** Patients welcomed this exercise as they not only better understood how RT is planned and given but also, why they might get some side effects from the RT. Furthermore, this extra knowledge helped them to better accept side effects and to better cooperate with bladder and bowel preparation during their treatment.

**Conclusions:** The use of the 3D VERTUAL system to explain patients how RT is given and delivered is not only highly welcomed by patients but also, it helps to reduce the fear factor many of them have before starting RT.

2019

POSTER

### Influence of High Density Inhomogeneity of Dental Prostheses in Radiation Therapy

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**Background:** Dental prostheses made of high density material contribute to modify dose distribution in head and neck cancer treatment. The study objective is to quantify dose perturbation due to high density inhomogeneity with experimental measurements and Monte Carlo simulations.

**Material and Methods:** Firstly, measurements in a phantom representing human jaw with thermoluminescent detectors (GR200A, 5 mm of diameter and 0.9 mm thickness) and EBT2 Gafchromic films in the vicinity of three samples: a healthy tooth, a tooth with amalgam and a Ni-Cr crown, irradiated in clinical configuration (6 MV photons, DSP = 94 cm, sample depth = 3 cm, 5 cm × 5 cm beam size). Secondly, Monte Carlo simulations (BEAMnrc code) are assessed in an identical configuration.

**Results:** Experimental measurements and simulation results confirm the two well-known phenomena: the passage of a low density medium to high density medium induced backscattered electrons causing a dose increase at the interface. Instead, the passage of a high density medium to a low density medium create a dose decrease near the interface. So, the results show a rise backscatter dose and a decrease after sample (only for crown) compared to the healthy tooth (see table).

|                    | Before sample |             | After sample |             |
|--------------------|---------------|-------------|--------------|-------------|
|                    | TLD           | Monte Carlo | TLD          | Monte Carlo |
| Tooth with amalgam | -2.6%         | -0.5%       | -4%          | +0.7%       |
| Crown              | +7.4%         | +25.9%      | -17.5%       | -17.7%      |

**Conclusion:** Although teeth with amalgam have a density of about 12–13, the changes generated are not significant. However, the results for crowns (density of 8) are very significant and the discordance observed may be due to thickness difference, 0.9 mm and 0.25 mm respectively for TLD and Monte Carlo. Now, the next step will be to evaluate algorithms implemented in clinical treatment planning system.

2020

POSTER

### Dual Phosphoinositide 3-Kinase/Mammalian Target of Rapamycin Inhibitor is an Effective Radiosensitizer for the Treatment of Colorectal Cancer

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**Background:** The phosphatidylinositol 3-kinase (PI3K), protein kinase B (AKT) and mammalian target of rapamycin (mTOR) (PI3K/AKT/mTOR) signalling pathway are reported to play a crucial role in the pathogenesis of colorectal cancer (CRC). Since radiotherapy became an important treatment strategy for locally advanced rectal cancer, we sought to investigate whether the use of dual PI3K/mTOR inhibitor, BEZ-235, can improve the radiation-related antitumour effects of CRC cells.

**Materials and Methods:** CRC cell, the KRAS mutant, HCT116 was irradiated with different dose of radiation (0–6 Gy). Determination of the therapeutic effect and cell cycle distribution of radiation alone, dual PI3K/mTOR inhibitor (BEZ-235) alone, and combining BEZ-235 with irradiation were analyzed by cell survival assay, and flow cytometry, respectively. Phospho-Akt (p-Akt), p-mTOR, p-4EBP, p-p70S6K, and p-eIF4E protein expression were assessed by immunoblotting. The treatment effect of radiation alone, BEZ-235 alone, and the combination of BEZ-235 and irradiation was further evaluated in the *in vivo* study of xenograft experiments using HCT116 CRC cells were done by subcutaneous inoculation of cells into 5–6 weeks old female C.B-17/lcr-scid-bg mice.

**Results:** The synergistic effects of combining radiation with different concentration of BEZ-235 were demonstrated in the cell survival assay. Cell cycle distributions showed that there was a significant increase in the percentage of cells exposing to the combination of BEZ-235 and radiation in the sub-G1 cells when comparing with cells with no treatment or treating with irradiation alone. Furthermore, the combination of BEZ-235 and radiation resulted in a caspase-dependent apoptosis in association with activation of caspase-9. In the *in vivo* effect of BEZ-235 in CRC xenograft tumour, we found that treatment with the combination of BEZ-235 and radiation had a significant inhibitory effect on tumour size ( $P < 0.01$ ) after 4 weeks of treatment than treatment with radiation alone or BEZ-235 alone. In addition, we found that irradiation alone up-regulated the expression of p-Akt, p-mTOR, p-4EBP, p-p70S6K, and p-eIF4E, however, the up-regulation of AKT/mTOR signalling pathway was attenuated by BEZ-235.

**Conclusions:** These findings indicate that the dual PI3K/mTOR inhibitor, BEZ-235, down-regulates radiation-induced Akt/mTOR signaling pathway and enhances therapeutic effects of radiation in CRC cells. The major mechanism of the synergistic effect of the combination of BEZ235 and irradiation-induced inhibition of cell growth of CRC is at least through the down-regulation of PI3K/Akt/mTOR pathway. This encouraging result provides a new approach for the combination of BEZ235 and radiotherapy in the treatment of CRC.

2021

POSTER

### "The Machine Fear"— Cancer Patients Undergoing Radiotherapy Treatment, an Observational Study

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**Background:** Cancer patients are often worried about both the disease and its treatments. The aim of our study is to evaluate patients' worries of the radiotherapy machine and the effects of the treatment on their mood.

**Material and Methods:** 46 patients in radiotherapy (58% male, 42% female; mean age: 65.5 years old, range: 46–75) were asked to undergo Profile of Mood States (McNair, Lorr, 1992) for monitoring fluctuating active mood states, Mini Mac (Watson, 1994) to value coping style and to a specific psychological interview concerning the feelings linked to the machine, the treatments and the socio-economical variables.

**Results:** The majority of patients is not afraid of the machine (91%), the rays (92%) and the noises (90%), only 7% complains about bad smells during treatments.

11% is worried about possible damages of machine and 13% about negative effects of the rays.

POMS analysis shows low levels of the factor depression dejection (98%), anger-hostility (93%), confusion-bewilderment (91%) and fatigue-inertia (97%).