Personne de contact
Nom: Poirier
Prénom: Alexis
E-mail: alexis.poirier@etu.unige.ch

Participation au prix ?
oui

Préférence pour la présentation
Présentation orale

Improving 3D-printing of megavoltage X-rays radiotherapy bolus with surface-scanner

Giovanna Dipasquale, Alexis Poirier, Yannick Sprunger, Johannes Uiterwijk

Department of Radiation Oncology, Geneva University Hospital, Geneva

Introduction:
Computed tomography(CT) data used for patient radiotherapy planning can nowadays be used to create 3D-printed boluses. This study investigates the use of a high-grade surface-scanner to produce, prior to the planning CT scan, a 3D-printed bolus in order to increase the workflow efficiency, improve treatment quality and avoid extra radiation dose to the patient.

Méthode:
A phantom was used to produce boluses in the orbital region from CT data, and from surface-scanner images. To quantify which boluses fit best they were scanned with CT. Hounsfield Unit(HU) profiles were traced perpendicular to the phantom's surface and were compared to HU values for calibrated air-gaps. Boluses were also created from surface scans of volunteers to verify feasibility in-vivo.

Résultats:
Phantom based tests showed a better fit of boluses modeled from surface-scanner than from CT data. Maximum bolus-to-skin air gaps were 1-2mm using CT models and always <0.6mm using surface-scanner models. Tests on volunteers showed good and comfortable fit of boluses produced from surface-scanner images acquired in 0.6 to 7 minutes.

Conclusion:
Regardless of the material or printing technique, 3D-printed boluses created from high-resolution surface-scanner images proved to be superior in fitting compared to boluses created from CT data. Tests on volunteers were promising, indicating the possibility to improve overall radiotherapy treatments, primarily for megavoltage X-rays, using bolus modeled from a high-resolution surface-scanner even in regions of complex surface anatomy.