Improving the accuracy and effectiveness of radiotherapy treatments through the clinical introduction of novel 3D-printed patient-specific boluses and positioning devices

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PURPOSE

Patient-specific boluses and anatomy positioning devices are frequently used in radiotherapy treatments, to either enhance the radiation dose to the cancer or push sensitive tissues away from the radiation beam. This project involved the clinical implementation of a novel 3D printing process, to routinely produce improved boluses and positioning devices that meet the specific needs of each patient.

METHODS

Depending on material, design and construction, conventional boluses and positioning devices may have undesirable effects on the radiation beam or be unstable or uncomfortable. In this project, a range 3D printing materials and methods were tested, while systems for verifying clinical suitability were developed. Staff and patient responses were used to indicate comfort and reproducibility.

The locally developed process for 3D printing boluses and positioning devices is now in clinical use. Since June 2019, the process has been used in more than 40 cases, initially starting with the rare and challenging anatomical sites where the greatest improvement was needed. Feedback from staff and patients was generally positive, with only one patient reporting concern that the bolus might move during treatment.

RESULTS

A patient who is comfortable is a patient who can remain still, and who can therefore receive the most precise, most effective treatment for their cancer. Lessons learnt from this clinical implementation project have the potential to improve the comfort, reproducibility and therefore quality of radiotherapy treatments delivered nationally and internationally.