Patient Case Study:
SCC of the Scalp

SCRIPPS M.D. ANDERSON CANCER
Department of Radiation Oncology
San Diego, CA, USA

Overview

Adaptiiv Medical Technologies Inc. (Adaptiiv) provides cancer centers with regulatory cleared software to design and 3D print patient-specific radiotherapy accessories.

The following patient case study is an excellent example of how Adaptiiv's software can effectively create a customized modulated electron bolus (MEB) to improve the efficacy of treating complex target volumes with electron beams. This case illustrates how a custom 3D printed accessory can be used to accurately verify that the dose is delivered as planned through in vivo dosimetry.

ADAP-CS-03 V00 2022-05-27

ADAPTIIV

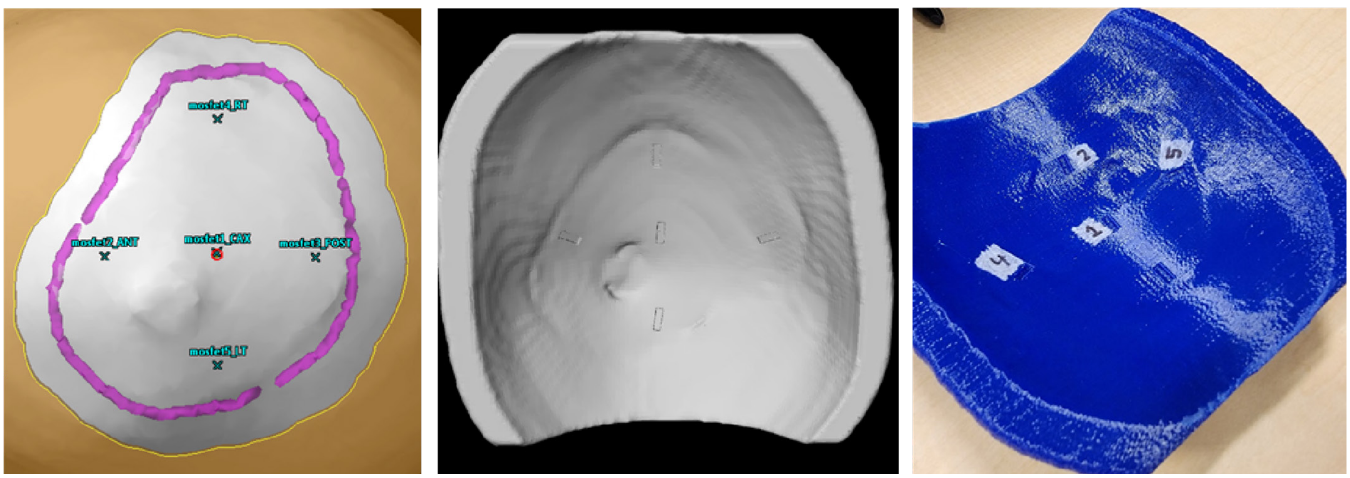
Description

A 78-year-old male presented with squamous cell carcinoma (SCC) of the scalp.

Fabrication and Treatment

Radiotherapy treatment of the scalp has traditionally faced challenges in delivering a uniform dose to a relatively large target area. This case had the additional challenge of presenting with nodularity of the skin surface. The convexity made the production of a traditional bolus with minimal air gaps and a reproducible placement complex. Air gaps can lead to adverse effects on the resultant dosimetry, and poor reproducibility can lead to improper placement and increased set up time.

An MEB was designed based on the patient's scalp surface to allow for the confirmation of the prescription dose to the target volume. At our institution, we perform in vivo dose measurements with MOSFETs on the first fraction to verify the patient setup and the delivered dose. Traditionally, it is difficult to place the dosimeters and be able to correlate their location to the planned dose. Adaptiiv's software can transfer points indicated by the physician in the planning system and create reference locations for the MOSFETs on the 3D printed bolus. This allows for easy and accurate in vivo dosimetry which can be used to verify bolus placement.



Left: Physician placed points in the treatment planning system (TPS). Middle: Dosimetry pockets created in Adaptiiv software from points imported from the TPS. Right: Final 3D printed bolus with pockets.

Dose

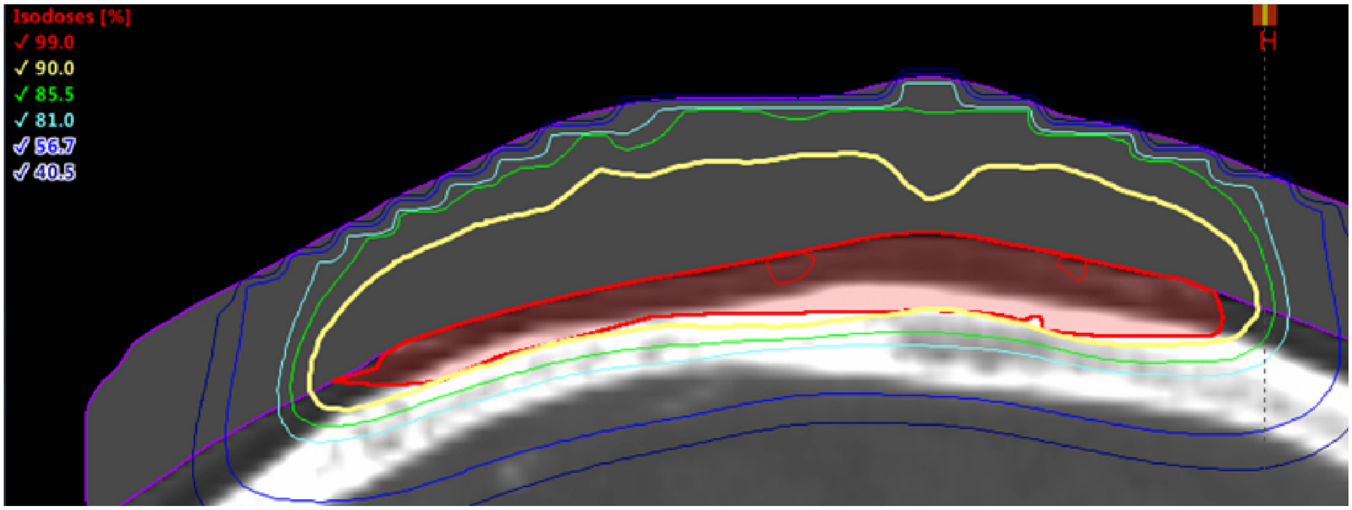
70 Gy in 35 fractions using a 9 MeV electron beam prescribed to the 90% volume.

Results

The use of custom 3D printed MEB illustrated the ability of the bolus to conform to a curved surface in a reproducible way with minimal air gaps. A uniform prescription dose was delivered to the indicated treatment volume. In addition, verification of the bolus position, and the calculated dose distribution is easily accomplished by using custom MOSFET dosimeter pockets embedded within the bolus.

Results (continued)

These pockets directly correlate to the measurement points indicated on the treatment plan by the physician. The MOSFET measurements for this patient were within 1% at all 5 positions. The fit of the bolus, the uniform dose distribution, and the accurate placement of the MOSFET detectors would not be possible with a standard commercial bolus.



The isodose distribution shows how the MEB could conform the prescription isodose line to the PTV with minimal hot spots.

Summary

The clinical advantages of the 3D printed custom modulated electron bolus are as follows:

1. In vivo measurements to verify bolus placement and the calculated dose are easily achieved.
2. Reproducible positioning for non-standard treatment techniques.
3. The bolus conforms better to the patient than other bolus, with minimal air gaps.
4. Dose sculpting can be achieved.
5. A uniform dose with minimal hot spots can be achieved.

ADAPTIIV

Adaptiiv Medical Technologies Inc.
1969 Upper Water Street, Suite 906
Halifax, NS B3J 3R7

info@adaptiiv.com
adaptiiv.com

Visit our website at adaptiiv.com or contact us to learn how Adaptiiv software can meet your clinical needs.

ADAP-CS-03 V00 2022-05-27