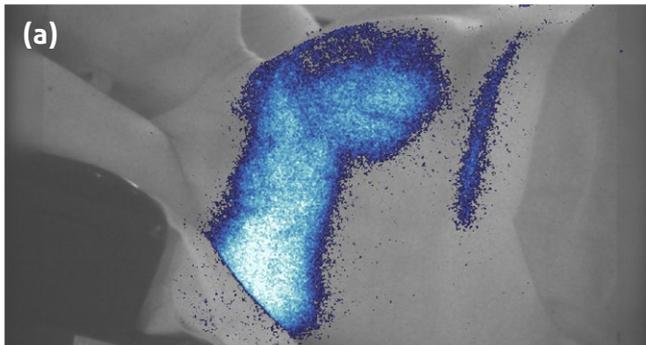
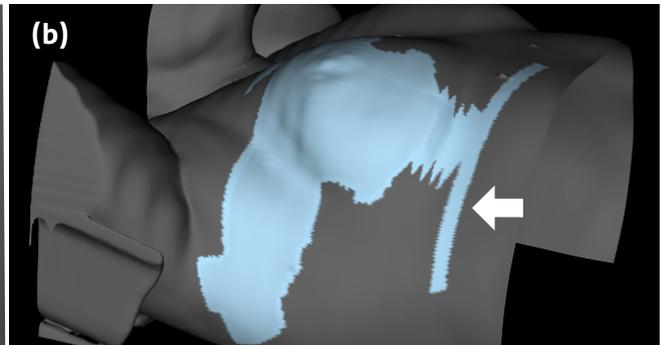


Unintended radiation dose due to MLC planning error identified by Cherenkov Imaging.¹



(a) A Cherenkov image taken during treatment revealing a sliver of dose to the lower chest.

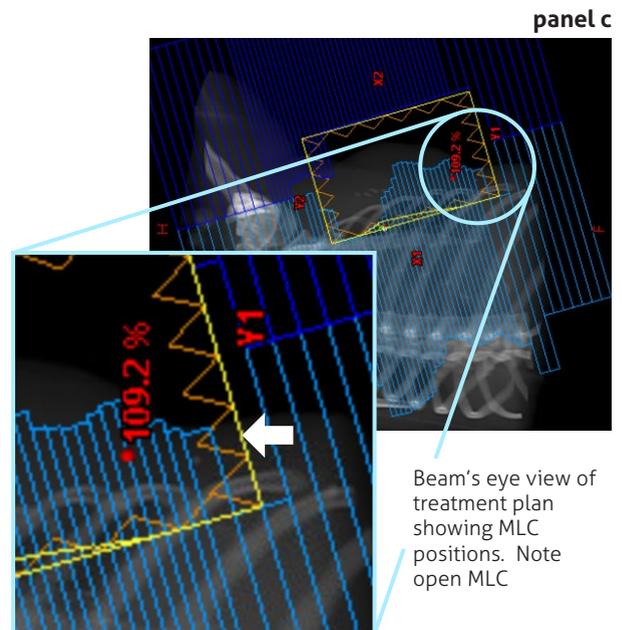


(b) The planned surface dose prediction from TPS, overlaid on the patient CT.

PATIENT: This patient was treated with a standard course of right sided whole breast radiotherapy which included a field-in-field modulation.

SUMMARY: The Cherenkov image taken during treatment (panel a) shows an open MLC on the lower chest wall. This was observed by the clinical team as a potential anomalous event. Subsequent review of the treatment plan revealed that the Cherenkov image matched the expected surface dose (panel b) and that the open MLC was inadvertently left open during planning.

DISCUSSION: The strip of dose on the inferior of the breast from the open MLC was only identified after reviewing the Cherenkov images taken during treatment. This sliver of dose did not seem consistent with the prescribed treatment and prompted an investigation. A review of the patient plan (panel c) revealed that the open MLC in question occurred on only one brief segment of the treatment and did not pose a significant exposure risk to the patient. The clinical team also investigated why it was not identified during the routine plan check and determined that it was a result of how the MLCs and jaws are represented in the TPS software. For this particular plan, the offending open MLC was directly adjacent to the jaw edge as indicated by the arrow in panel c, and the software representation of the open MLC and the jaw make it difficult to determine where one ended and the other began. As a result, the single open MLC was missed in the review of the plan this is not something that would have been caught during patient setup with the field light nor during routine imaging.



panel c
Beam's eye view of treatment plan showing MLC positions. Note open MLC

KEY LEARNINGS: Cherenkov imaging was able to capture a planning error of a single MLC. Fortunately, this event did not result in harm to the patient, however, it did identify a potential systematic failure mode in the planning process, which, under different circumstances, could lead to patient harm. An important outcome from this event is to ensure TPS viewing settings are set such that open MLC and jaw edges are clearly distinguishable.