

IROC TBI Phantom Results

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Purpose:

This work reports the development and initial results from irradiations of IROC's TBI anthropomorphic phantom.

Methods:

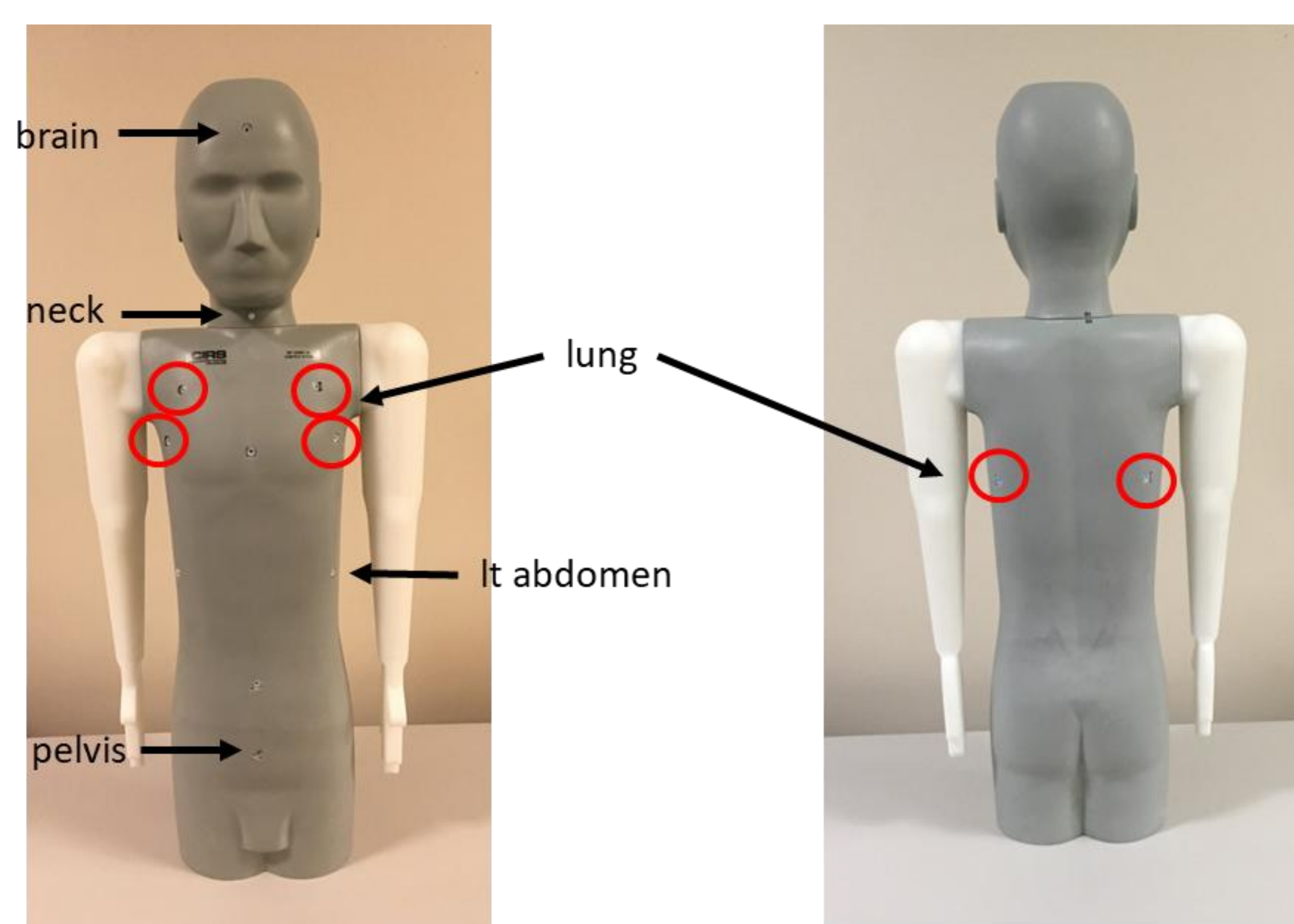
IROC customized a CIRS 10-year-old phantom by adding 13 TLD locations and building attachable arms from high-impact polystyrene. 3 TLD are located in each lung, one in the brain, one in the neck, one in the mediastinum, one at the umbilicus, one in each kidney, and one in the pelvis. Sites were instructed to deliver 3 Gy to the umbilicus in the manner that they treat patients. If they treated patients with a combination of an open beam and a beam with lung blocks, the phantom was irradiated once with each method. TLD results were compared to the dose predicted by the institution.

Results:

The phantom has been irradiated 105 times by 47 institutions since 2017. 12 of the irradiations were VMAT, with the majority of those irradiated since 2023. The remaining were irradiated with opposed fields or sweeping arcs. The phantom was irradiated in a sitting, standing, supine, or decubitus position.

Meet Hansel and Gretel

- 2-fold purpose
 - Credentialing
 - Lung dose measurements
- 10 yr old pediatric CIRS phantom
- No slices
- No pre-drilled holes
- Arms added
- 13 TLD locations



Results continued:

Criteria for the traditional non-VMAT irradiations were set as $\pm 5\%$ of the prescription dose at the prescription point and $\pm 15\%$ of the prescription dose for other locations (excluding the lung). Criteria for the VMAT irradiations were set as $\pm 5\%$ of the prescription dose at the prescription point and $\pm 7\%$ of the planned dose for the other non-lung TLD. Due to highly variable doses in the lung, TLD in the lung were not included in the criteria for any treatment. The pass rates were 73% for the traditional irradiations and 92% for the VMAT irradiations. Disagreement exceeded 50% for some points in the lung.

Conclusion:

IROC's TBI phantom shows a variety of traditional TBI techniques as well as increasing use of VMAT TBI irradiations.

Innovation/Impact:

Despite the recent increase in the use of VMAT for TBI treatments, institutions still have a wide variation in delivered dose. Traditional TBI treatments do not produce uniform dose distribution in the lungs. The delivered dose varies widely between institutions.