# A Dosimetric Comparison of Whole Breast Treatment Planning on Three Most Advanced Radiation Therapy Dose Delivery Systems


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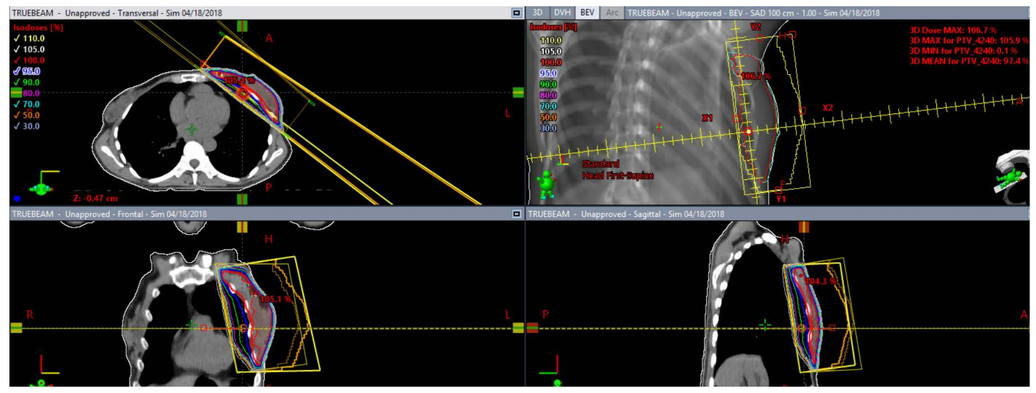
## OBJECTIVES

**The purpose of this study was to perform a dosimetric comparison of whole breast treatment plans generated from a conventional C-arm linear accelerator Varian Truebeam (TB) and two ring delivery systems (RDS): Varian Halcyon and Accuray Tomotherapy (Tomo), and to evaluate their respective benefits and limitations.**

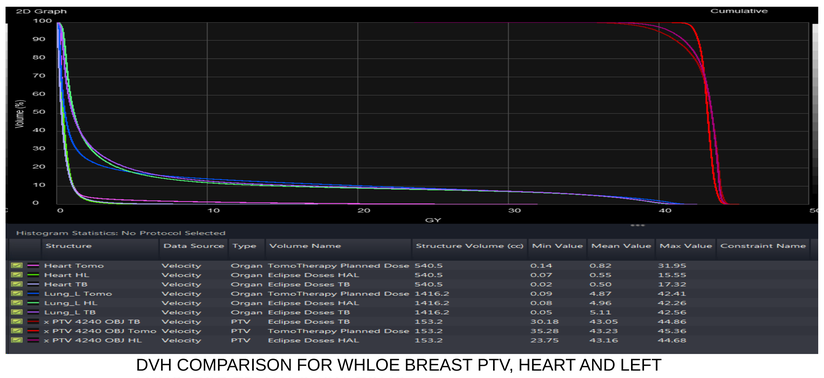
## MATERIALS and METHODS

**Methods**: This prospective study was conduced on on three radiation delivery systems: TB, Halcyon, and Tomo. Two parallel opposed tangential fields were designed utilizing 6MV for TB and Tomo, and 6MV FFF for Halcyon. All patients (n=10) were simulated in the head- first supine position on a breast board. The planning target volume (PTV) contoured by the physician was utilized for dose optimization for Tomo and designing treatment fields for TB and Halcyon. A total dose of 42.40Gy was delivered in 16 fractions. The dose coverage to PTV and dose constraints to organs-at-risk (OARs) were evaluated and compared.

True beam: KV SET UP, COUCH AND GANTRY STATIONARY DURING TREATMENT, MLC 1CM AND 5MM



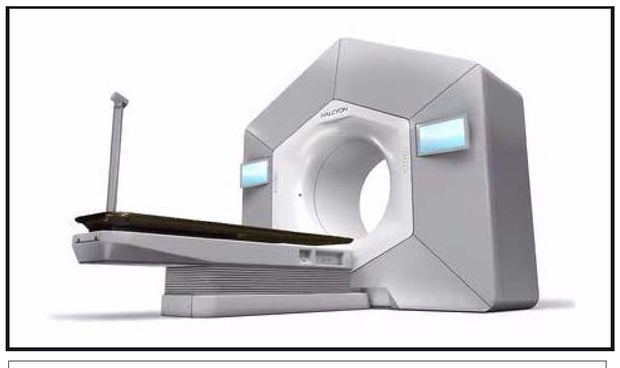

ISODOSE LINES and BEV FOR TRUEBEAM



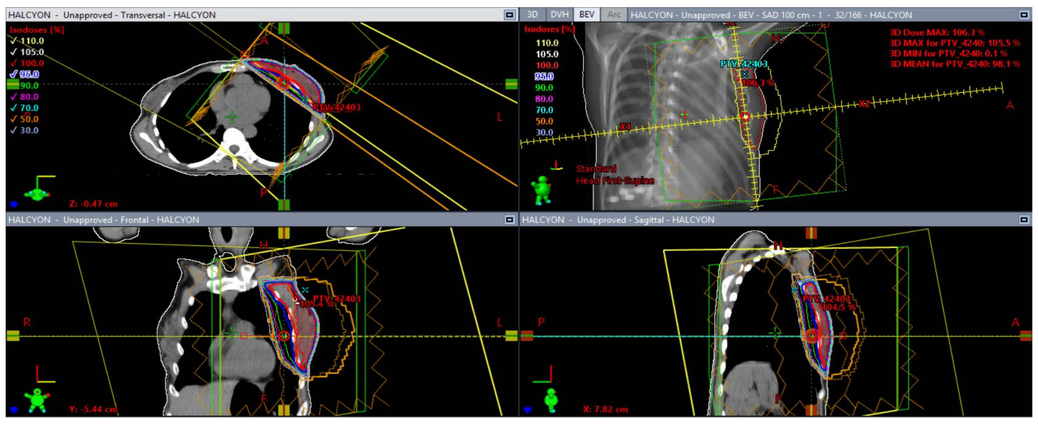

DVH COMPARISON FOR WHLOE BREAST PTV, HEART AND LEFT LUNG FOR TB, HALCYON, TOMO

## RESULTS

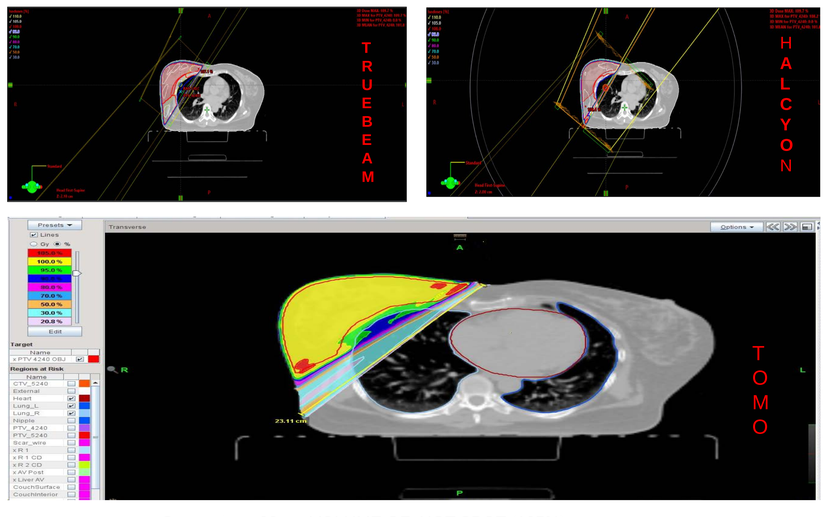
The dose coverage goal to PTV breast was D90% ≥ 90% Rx and average max point dose was under 107% for transverse breast separation less than 22cm and under 110% for separation greater than 22cm for all TB, Halcyon, and Tomo. Ipsilateral lung dose average V20Gy, average heart mean dose and the average delivery time was (14.1%, 12.8%, 11.8%), (2.1, 2.6, 2.3Gy), and (60, 23.6, 224.7seconds) respectively for TB, Halcyon and Tomo.



Halcyon :SET UP: CBCT EVERY TREATMENT AND REPRODUCIBILTY IS QUICK
COUCH IS STATIONERY AND GANTRY ROTATES DURING TREATMENT
MLC: DOUBLE STACK THICKNESS 1CM

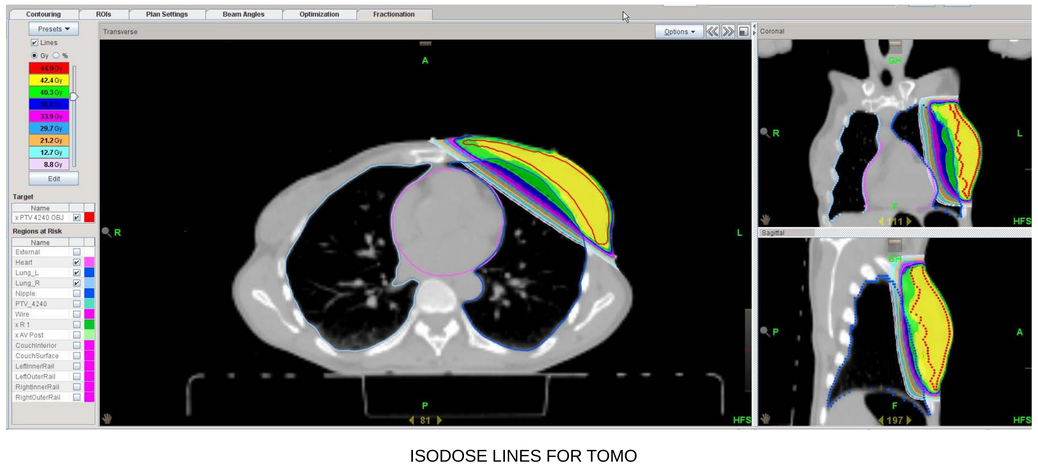



ISODOSE LINES and BEV FOR HALCYON




Separation >22cm, VOLUME OF HOT SPOT (105%)

Tomo : MVCT EVERY TREATMENT
COUCH AND GANTY MOVES DURING TRAMENT
MLC THICKNESS 0.625CM AT THE ISO




ISODOSE LINES FOR TOMO

## CONCLUSION

There was no significant difference for PTV coverage and normal tissue constraints when comparing TB, Halcyon, and Tomo for transverse breast separation less than 22 cm. When the separation is greater than 22cm, plans generated by all three systems resulted in larger volume of hotspot (105%) to achieve a goal for PTV coverage. Single energy and bore size are the main limitations for Tomo and Halcyon. The treatment planning time and dose delivery time for Tomo was longer. Halcyon had the shortest dose delivery time.

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