AbstractID: 6420 Title: Experience with Thoratec Left Ventricular Assist Device (LVAD) during radiotherapy treatment

Purpose:
This poster describes the response of a Thoratec left ventricular assist device (LVAD) to the scatter, leakage, and RF environment in a linear accelerator vault. The device contains a mechanical pump attached to the abdominal wall that the supports left ventricle in circulating blood. Cannulae connect the paracorporeal pump to the ventricle. An electric lead relays pump filling information to the TLC-II computer-controlled driver, and a pneumatic lead transfers positive air pressure to the pump and ejects the blood.

Method and Materials:
The treatment plan was 4500 cGy to the rectum over 25 fractions with three 15MV photon beams on a Varian 2100EX. All beams avoided the pump and leads. The response to EMI was evaluated by observing a duplicate driver in the treatment configuration as the patient's fields were delivered to a 30x18x60cm^3 solid water equivalent phantom. Pre-treatment dose assessment included calculations with Pinnacle treatment planning system, AAPM TG36 data analysis, and MOSFET measurements with high sensitivity bias on the surface of the driver during the phantom irradiation. During the first patient treatment, MOSFETs were placed on the pump and leads under 1cm of bolus, approximately 1cm from the left lateral treatment portal. No additional shielding was applied to the LVAD.

Results:
EMI interference was absent and the LVAD operated normally during the pre-treatment test and throughout the treatment course. Radiation to the driver was too low to be detected by the MOSFETS. Cumulative dose estimates to the pump were 425cGy to 0.1cc (DVH), 262.8cGy (TG36), and 158.5cGy (MOSFET). MOSFET readings to the leads were 70.5cGy.

Conclusion:
External beam radiation treatment was safely delivered to a LVAD dependent patient. The Thoratec TLC-II exhibited no adverse response to EMI and doses up to 425 cGy. Our results are based on one case and further study is encouraged.