

RADIATION TREATMENT OF PATIENTS WITH CARDIAC PACEMAKER: WEDGE TYPE EFFECT ESTIMATION

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Introduction

An increasing number of pacemaker patients appear lately in our department as radiotherapy candidates. The need hence arises to accurately determine the radiation burden of pacemaker devices for radiotherapy patients, given the limited tolerance of such devices reported by manufacturers and modify treatment planning parameters, such as wedges, accordingly.



Purpose

This study aims to investigate the dependence of pacemaker dose on the type of wedge filter implemented in the radiotherapy machine, by measuring the effect of dynamic wedges as well as the effects of physical and motorized wedges.

Materials and Methods

- Two different linear accelerators with Motorized (MW), Physical(PW) and Enhanced Dynamic Wedges (EDW) as well as two different treatment planning systems
- Water Phantom, PTW MP3-M
- PTW Semiflex 31010 (0.125cc), thimble Ionization Chamber

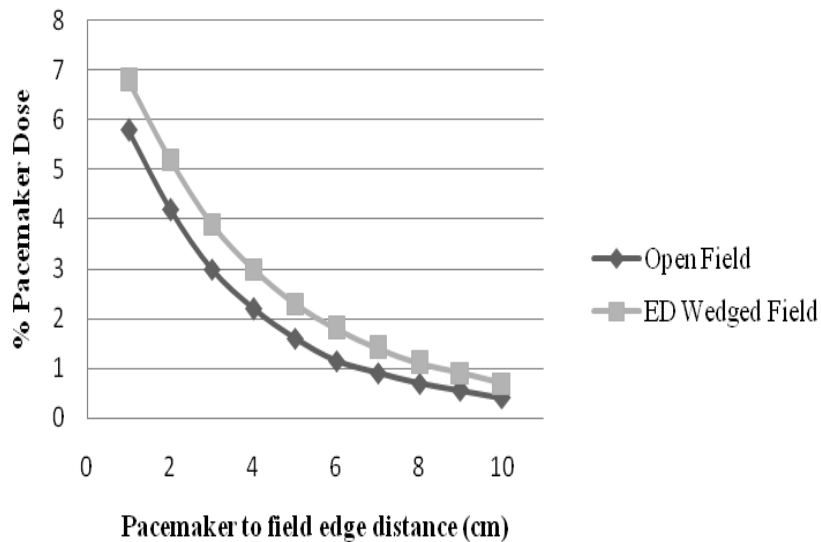
Materials and Methods

- Measurements were performed:
 - With 6MV photon beams
 - For distances 1cm - 10cm from field edge
 - For open and wedged beams (EDW, PW, MW)
 - Field was 10x10 at isocenter distance and the depth of measurement was 5 cm in water

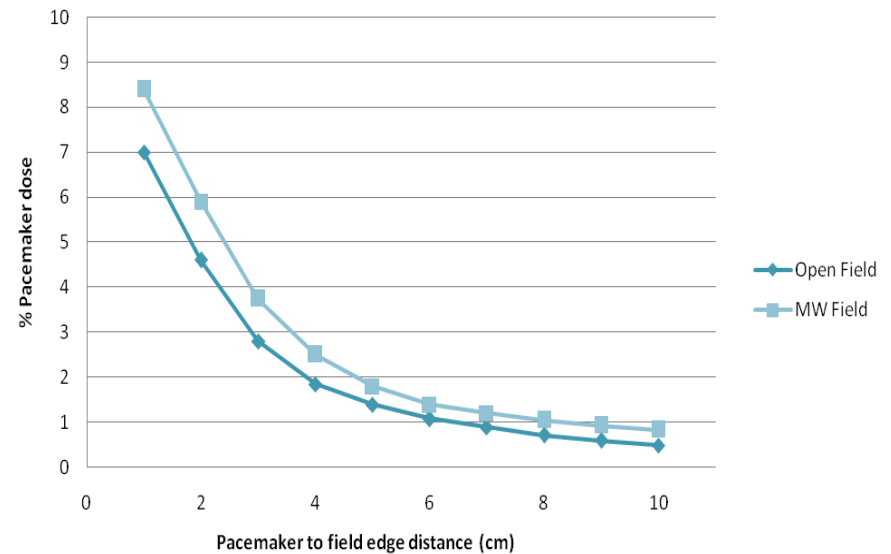
Results

The wedge filter can elevate the pacemaker dose compared to that of an open field. This effect is more profound for fields closer to the pacemaker.

Pacemaker dose from EDW

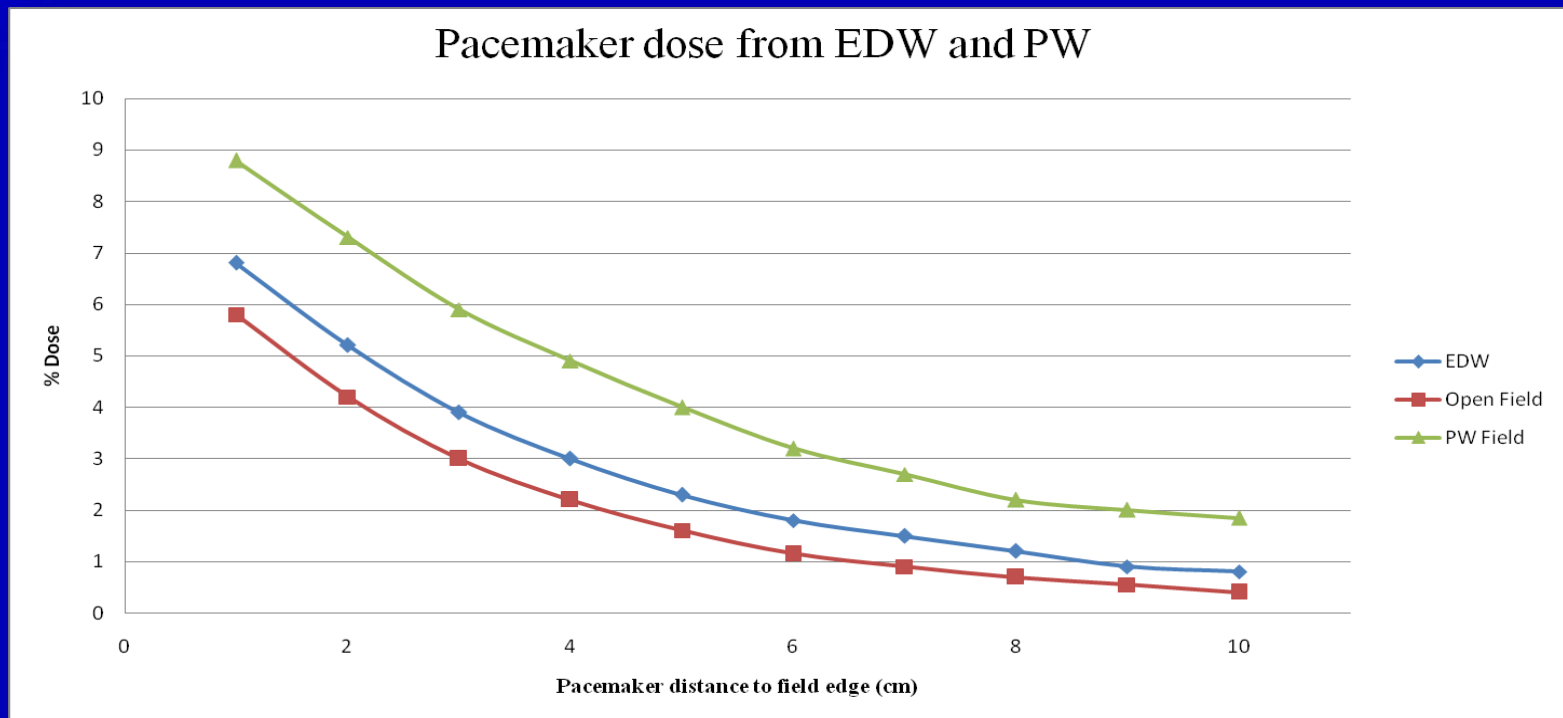


Pacemaker dose from MW



Results

The pacemaker dose is less for the EDW when compared to the dose due to PW. Clinically, this is an advantage of EDW wedged fields.



Results

Treatment Planning Systems (TPS) showed inaccuracies in calculating dose to pacemakers when the devices were at a distance from the irradiated volume. TPS calculation accuracy decreased with increasing distance from field edge. Pacemaker dose was underestimated by the TPS by more than 10%.

Conclusion

This study provides data about the pacemaker exposure for different wedge systems (EDW, PW, MW). Furthermore, it was found that the treatment planning system's errors can not be neglected for out of field dose estimations.

References

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