



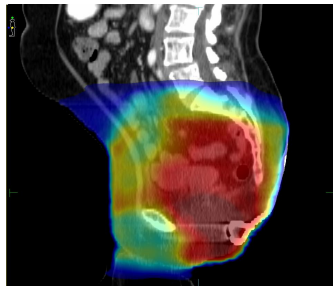
Reduction of Skin Dose with compensator based IMRT compared to MLC based Delivery



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BACKGROUND AND PURPOSE

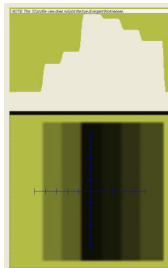
- GI 2008 ASCO poster presentation -Bazan JG et al, Proc ASCO 476
- 29 pts, treated from 1993-2006 16 tx with CRT, 13 IMRT
- 9 pts CRT group >2 non-hemetologic toxicity vs 2 pts IMRT, P=.02
- 14 pts CRT group required breaks vs 2 pts IMRT, P=.0005
- Mean tx duration CRT 59.1 days vs 37.8, P<0.0001
- IMRT group better outcome but may have had lower stage disease
- The experience at Moffitt shows significantly fewer treatment breaks and better local control when using IMRT and will be reported on in the up coming months.



Above is a typical IMRT dose distribution for an anal cancer patient treated prone with IMRT with 180cGy to CTV and 200 to GTV.

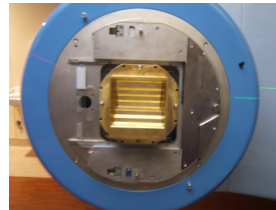
Our early IMRT experience showed significant skin reaction.

By switching to compensator based IMRT, skin reaction issues were significantly lessened and there have been only 2 patients requiring treatment breaks. 1 patient had small volume desquamation requiring a 4 day break, and the other was on prolonged break due to pseudomembranous colitis.



MATERIALS AND METHODS

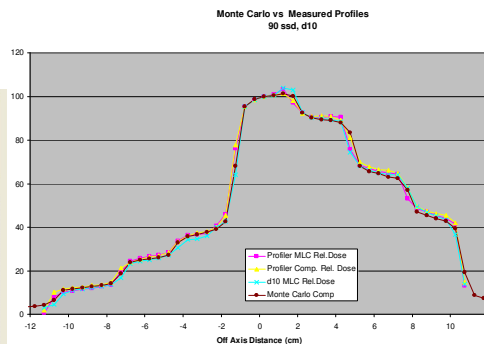
- We wanted to examine the cause for the difference in skin dose.
- Monte Carlo calculations can separate out the effects of electron contamination from the obvious beam hardening and how these vary with MLC segment size, SSD etc.
- Varian Medical Systems provided their "Monte Carlo Package" (the data required to model an accelerator with Monte Carlo)
- We designed a step-wedge type compensator for the purposes of comparing skin doses. (Dot Decimal provided the custom compensator)



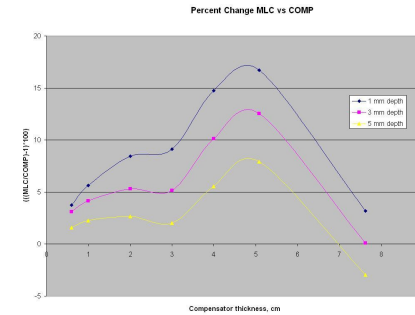
- The dose profile of the compensator was measure at 90 SSD and 100 cm
- A series of MLC segments were designed on Varian's shaper program to mimic the dose profile of the compensator at 10 cm.
- The Monte Carlo calculation was first tested to match open field data for 6X. The compensator and MLCs were added and all profiles were matched at 10 cm depth.
- Using the established delivery techniques for both compensator and MLC pattern the doses were measured at 1mm, 3 mm, and 5 mm depths to establish the changes in skin dose.
- Monte Carlo was then used to separate out the electron and photon components of the dose

RESULTS

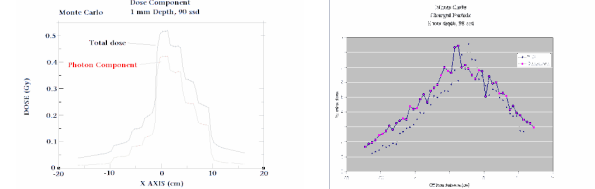
Below are the profiles measured for the Compensator, the MLC patterns and the Monte Carlo simulations for both



Skin Doses



Above is the measured ratio of skin doses from the MLC patterns to those of the compensators. There is nearly a 9% increase in skin dose from the MLC patterns compared to 2 cm of compensator.



The component analysis from the Monte Carlo indicates there is very little difference in skin dose due to electrons suggesting that the difference in skin dose is primarily due to beam hardening.

Conclusions and future work:

There is a substantial increase in skin dose from the MLC patterns which the monte carlo simulations suggest is primarily due to beam hardening.

Future work will include analysis of the spectra for the two deliveries and analyzing the effects of SSD and MLC segment size.

This work is sponsored through a research contract with Dot Decimal and the Moffitt Cancer Center