Dosimetric Comparison of Cs-131 to I-125 for Treatment of Ocular Melanoma

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Purpose/Objective

Currently, 125I is used to treat Ocular Melanoma under the COMS protocol. Recently, a new isotope, 131Cs, has come to the market as an alternative to 125I. The current study was undertaken to determine if conditions exist under which it is dosimetrically advantageous to use 131Cs as an alternative to 125I in eye plaques. Dosimetry plans were developed varying treatment time, air kerma strength and prescription dose.

Materials and Methods

The dosimetry of ten previously treated patients were evaluated comparing 125I seeds (Best Medical 2301) and 131Cs (IsoRay Cs-1R2) seeds in identical configurations of standard COMS eye plaques. Calculations were performed using TG43 dosimetric parameters in ADAC Pinnacle V7.6c treatment planning software. Plans for 131Cs were developed using the COMS prescription dose of 85 Gy. Two plans for each patient were created, one varying air kerma strength and the second by altering the treatment time.

Results

The dosimetry plans were developed varying implant time, air kerma strength and prescription dose. The differences in each isotope’s half-life (59.6 days for 125I vs 9.7 days for 131Cs) would indicate a likely difference in biologically effective dose (BED) for each of the two isotopes. Consequently, 131Cs plans were also created over a dose range of 60-95 Gy to determine if optimal conditions exist where 131Cs may result in reduced doses to critical structures as compared to 125I.

Conclusions

Given the standard COMS prescription dose at the tumor apex, 131Cs delivers greater doses to critical structures regardless of changes in implant duration or air kerma strength. 131Cs has been shown to deliver decreased doses to critical structures if the prescription dose is less than 80 Gy. Significant reduction in the dose to the sclera, macula, optic disk and lens may be achieved if the biologically effective dose is determined to be less than or equal to 75 Gy for most cases. Given this it may be possible for reduced complications for patients undergoing treatment for ocular melanoma.

Additional work is needed to determine the biologically effective dose. Future work should also include evaluation of an appropriate dose rate range in conjunction with the BED.