

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.

Differences in each isotopes half life (59.6 days ¹²⁵I vs 9.7 days ¹³¹Cs) would indicate likely difference in biologically effective dose (BED) for each of the two isotope. 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.

Table 1. Patient Planning Parameters

Patient	Base Short (mm)	Base long (mm)	Apex (mm)	Plaque Size (mm)	MT (mm)	BM (mm)	DT (mm)	BD (mm)	Implant Time (hr)
1	10.0	13.0	5.0	18	6.8	12.9	8.4	12.9	96
2	6.0	10.6	6.6	16	3.5	5.0	7.0	5.0	96
3	14.0	15.0	7.0	18	6.0	14.0	7.0	14.0	96
4	9.1	9.6	9.7	14	16.0	9.6	13.0	9.1	120
5	7.0	9.0	2.5	14	-1.1	10.0	1.2	10.0	96
6	8.0	9.0	3.0	14	1.4	9.0	1.0	9.0	96
7	12.0	14.0	6.2	18	8.0	14.0	7.0	13.0	96
8	12.0	16.0	7.3	20	7.0	16.0	4.0	16.0	120
9	5.0	12.0	3.5	16	0.1	12.0	3.5	12.0	96
10	8.0	12.0	3.0	16	0.8	12.1	3.1	12.0	96

Results

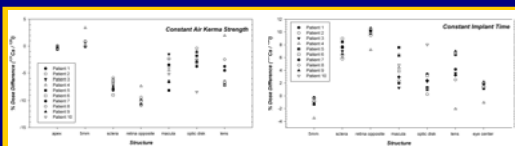


Figure 1. Comparison of ¹³¹Cs to ¹²⁵I for an 85 Gy Rx by varying implant time and air kerma strength.

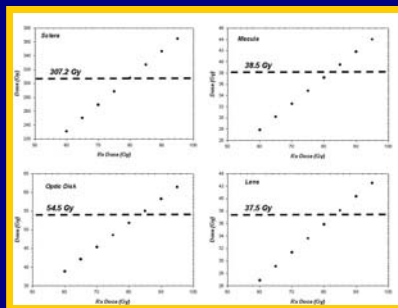


Figure 2. Dose to critical structures as a function of Rx dose for patient 8 (20 mm plaque). Dashed lines indicate the ¹²⁵I plan dose. Note that dose to the sclera below 80 Gy Rx result in reduced doses for all critical structures.

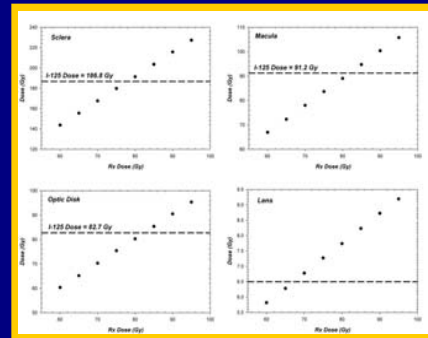


Figure 3. Dose to critical structures as a function of Rx dose for patient 6 (14 mm plaque). Dashed lines indicate the ¹²⁵I plan dose. Note that dose to the sclera below 80 Gy Rx result in reduced doses for all critical structures except the lens. Reduction in lens dose for this patient required a Rx dose of <69 Gy as compared to the ¹²⁵I plan.

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 equals 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.