Calibration of Radiance Intravascular Brachytherapy Sources

BACKGROUND: Intravascular brachytherapy has been investigated to reduce restenosis following angioplasty with promising results using both beta and gamma radiation sources. Radiance Medical Systems has developed a solid, sealed beta source radioactive balloon. A system has been developed to determine contained activity and correlate to external dose rates.

METHOD: The radioactive balloon catheter is analyzed initially using a scintillation system measuring Bremsstrahlung radiation. The balloon is destructively destroyed and a significant amount of the activity is transferred to another system. The original system is then reanalyzed and the percentage transferred determined. The transferred activity is calibrated using liquid scintillation techniques traceable to NIST. Knowing the percentage of original activity transferred, the original balloon activity is calculated. This is then correlated to dosimetry measurements made at Cedars-Sinai Medical Center.

PRELIMINARY RESULTS: Two balloons have been analyzed, with additional balloons in process. Activity transferred has been in the range of 70%. The activity using liquid scintillation can be calibrated to an error of ±2% (2σ) and the entire calibration of the balloon can be made to ±4% (2σ).

DISCUSSION: This method provides correlation between the contained activity and both a quick measurement system (counting Bremsstrahlung radiation on a scintillation system such as a germanium detector) and the dose rate (determined by radiochromic film). Future work will involve direct calibrations by NIST and an intercomparison program with the ADCLs.

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