AbstractID: 2881 Title: A Study on Output Factors for Gamma Knife Model B2 Unit with Various Dosimeters

Purposes: To verify the output factors (OFs) of Gamma Knife Model B2 by various conventional dosimeters and to determine an effective correction factor for compensating the dosimeter sizes.

Methods and Materials: The TLDs, radiochromic films, PTW 31002 ion chamber and the diamond detector were used to obtain the OFs, normalized to the 18 mm helmet, for four helmets. The factors were measured in the centre of an 80 mm polystyrene spherical phantom that was positioned at the mechanical center of the machine. The dosimeters were placed in the center of the sphere using different cassettes and oriented their effective center in the center of helmet coordinate system. Based on the volumetric averaging theory we used the specificity of dose profile of the 4 mm helmet to correct the measurement by the integrated Gaussian curve method.

Results: The relative OFs measured with TLDs/ion chamber, before applying correction factors, were 0.977/0.967, 0.905/0.845 and 0.755/0.313 for the 14, 8 and 4 mm helmets, respectively. After applying correction factors, the results show a reasonable agreement with the data used in the current RTP system for Gamma Knife procedure. The results also showed great spatial accuracy. The symmetry of spatial distribution was 1.84%, 0.59%, 1.25%, and 1.16% for the 4, 8, 14 and 18 mm helmets, respectively. And the distance between mechanical center and dosimetric center was less than 0.25mm for all four helmets.

Conclusions: The accuracy of the measurements was affected by a number of factors, especially the dosimeter size. This work provides the potential for using conventional dosimeters, with appropriate correction factor, to determine and to evaluate the clinical dosimetric parameters for Gamma Knife Unit for routine QA procedure. With the verification of spatial accuracy, Gamma Knife unit could be used to treat functional disorder case accurately.