Purpose: The gamma-index method was developed to quantitatively compare treatment planning system (TPS)-derived dose distributions for external-beam radiotherapy with measured dose distributions. However, the clinical medical physicist does not measure brachytherapy dose distributions and the use of this method for brachytherapy appears novel. The purpose of this study was to evaluate the accuracy of several TPS-derived brachytherapy dose distributions in comparison to reference brachytherapy dose distributions, and suggest dose and distance criteria such as those recommended in the AAPM Task Group 56 report.

Methods: Reference brachytherapy dose distributions from Monte Carlo (MC) simulations were commissioned into the Pinnacle TPS. MC and TPS dose distributions for several HDR and LDR sources were imported into the OmniPro I'mRT software and compared. Sensitivity of distance-to-agreement for 1 mm =< delta(d) =< 5 mm and dose difference for 1% =< delta(D) =< 10% were investigated. TPS dose characterization was considered successful when at least 98% of all pixels examined satisfied a pass tolerance r =<1.00.

Results: At least 98% pixels passed for delta(d) = 2 mm and delta(D) = 2%. For delta(d) >= 3 mm and delta(D) >= 3% criteria, r =< 1.00 for all pixels. Failure regions were located within the brachytherapy source, near the brachytherapy source surface, or in high dose-gradient regions (>50%/mm). A potentially useful standard is delta(d) = 2 mm and delta(D) = 2%.

Conclusions: The gamma-index method was used to evaluate brachytherapy dose distribution comparisons, and agreement criteria were proposed. The medical physics community may further investigate this method and consider standardized criteria for brachytherapy dosimetry.