Purpose:

To compare gamma knife treatment plans that use skull scaling instrument measurements for skull definition vs. CT based skull definition.

Methods:

Eight previously treated patients who had head CT scans were randomly selected. Their CT images were imported into Leksell GammaPlan. For each patient, three dose plans were developed: 1. the reference plan. It was planned based on the standard clinical treatment planning guidelines. Measurements were used for skull definition and TMR10 for dose calculation algorithm. 2. CT TMR10 plan, a recalculation of the reference plan with CT images used for skull definition 3. CT Convolution plan, a recalculation of the TMR10 plan using convolution algorithm. The treatment times for CT TMR10 plan and CT convolution plan were set to be the same as the reference plan by adjusting the prescription dose level. Prescription dose and shots were left unchanged. Plan comparisons were carried out using minimum dose, target coverage, gradient index and selectivity.

Results:

On average, the minimum dose for CT TMR10 and CT Convolution plans are 1.8% and 6.5% lower than that of the reference plan. The target coverage, gradient index are comparable for these three plans. The selectivity indices for CT TMR10 and CT Convolution plans were found to be 3.1% and 9.8% higher than that of reference plan.

Conclusions:

This work indicates the measurement based skull definition could result in inaccurate calculation in minimum dose to the target. The target coverage and gradient index are however uncompromised. The selectivity index was actually underestimated.