

One DLG NOT for all: beam field specific DLG to improve portal dose prediction accuracy

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CONTRIBUTION/INNOVATION

- ❑ A global Dosimetric Leaf Gap (DLG) is mandatory in Eclipse 16.1 or earlier versions for leaf sequence calculation and dose calculation to model the leaf-end leakage.
- ❑ Clinical plans could benefit from a different DLG value to reduce the discrepancy between the calculated and the measured doses.
- ❑ Our contribution was to demonstrate there is no single optimal DLG that works for any plan. Each beam field corresponds to a single optimal DLG that results in the highest Gamma Passing Rate (GPR) with a given criteria.

MATERIAL/METHODS

- ❑ 68 beam fields were retrospectively selected from 28 clinical plans that originally failed patient-specific QA using the portal dosimetry.
- ❑ The predicted portal dose was re-calculated using the same leaf sequence and same MU but with nine different DLG values varying from zero to eight times of the measured DLG. The originally measured portal imaging was compared to the predicted dose with different DLG values using the gamma analysis.
- ❑ The optimal DLG value was determined for each field by the highest gamma passing rate (GPR) with the same 2mm/2% criteria.
- ❑ The relationship between the common beam complexity metrics, such as the edge metric (EM) and modulation complexity score (MCS), and the optimal DLG value was also investigated.

RESULTS SUMMARY

The results from the included 68 beams demonstrate there is no single optimal DLG that can be applied to all beam fields and plans. The optimal DLG values spanned across all nine levels of DLG. It is also shown there is no obvious correlation between the optimal DLG values and the selected beam complexity metrics.

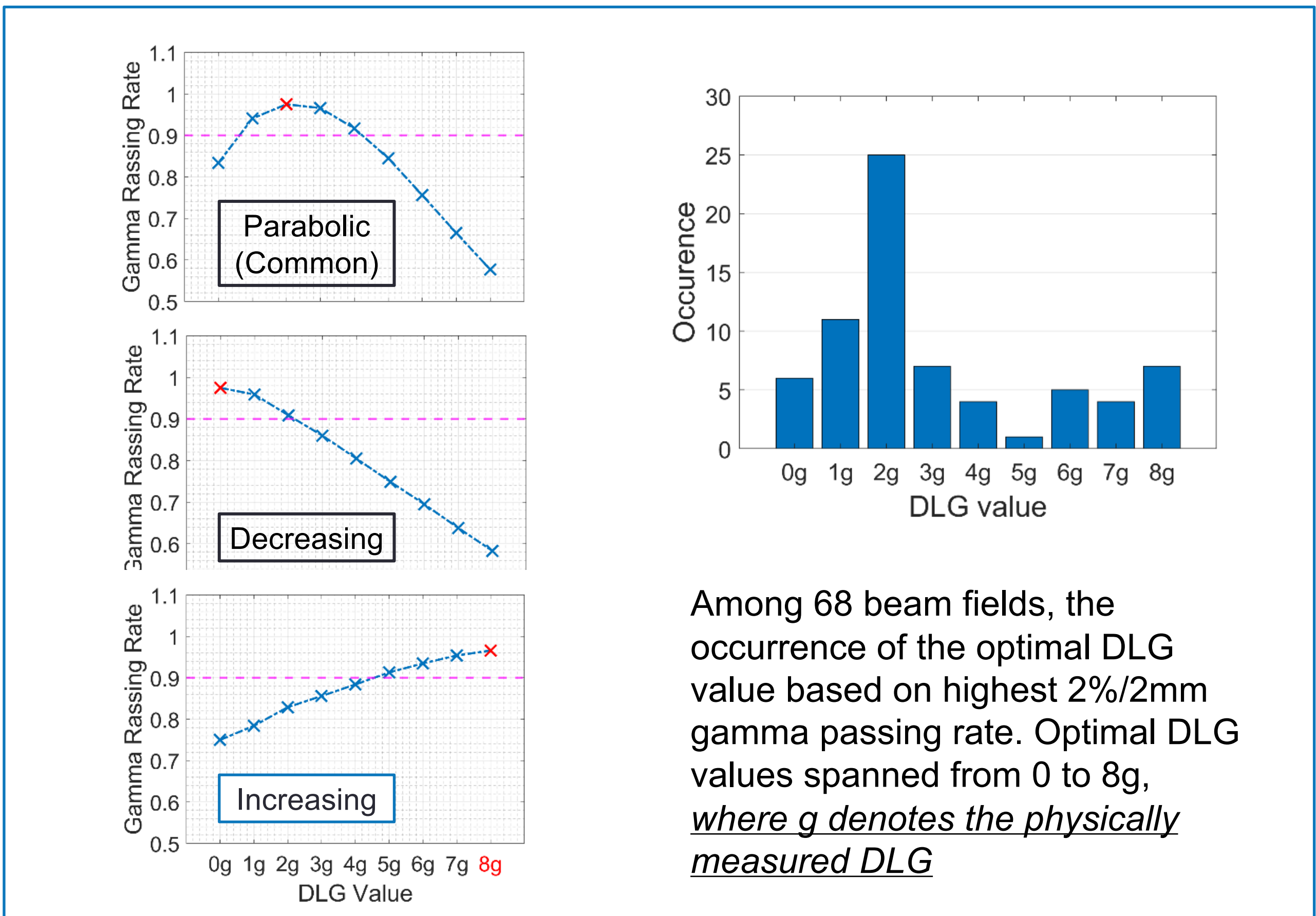
CLINICAL GUIDANCE

Two different DLG values for dose calculation in Eclipse at our institute. A simple triaging rule-of-thumb is that any SBRT and SRS plans are recommended to use experimentally measured DLG value, i.e. DLG = g, and conventional 3D, IMRT, VMAT are recommended to set a larger DLG value, e.g. DLG = 6g.

Study Conclusion
 A beam-field-specific DLG is better than a universal DLG!

Clinical Practice
 We have implemented two DLG values for accurate clinical plan dose calculation.

Different DLG values result in different dosimetric outcomes



Significant improvement in QA passing rate for clinical plans

