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Purpose

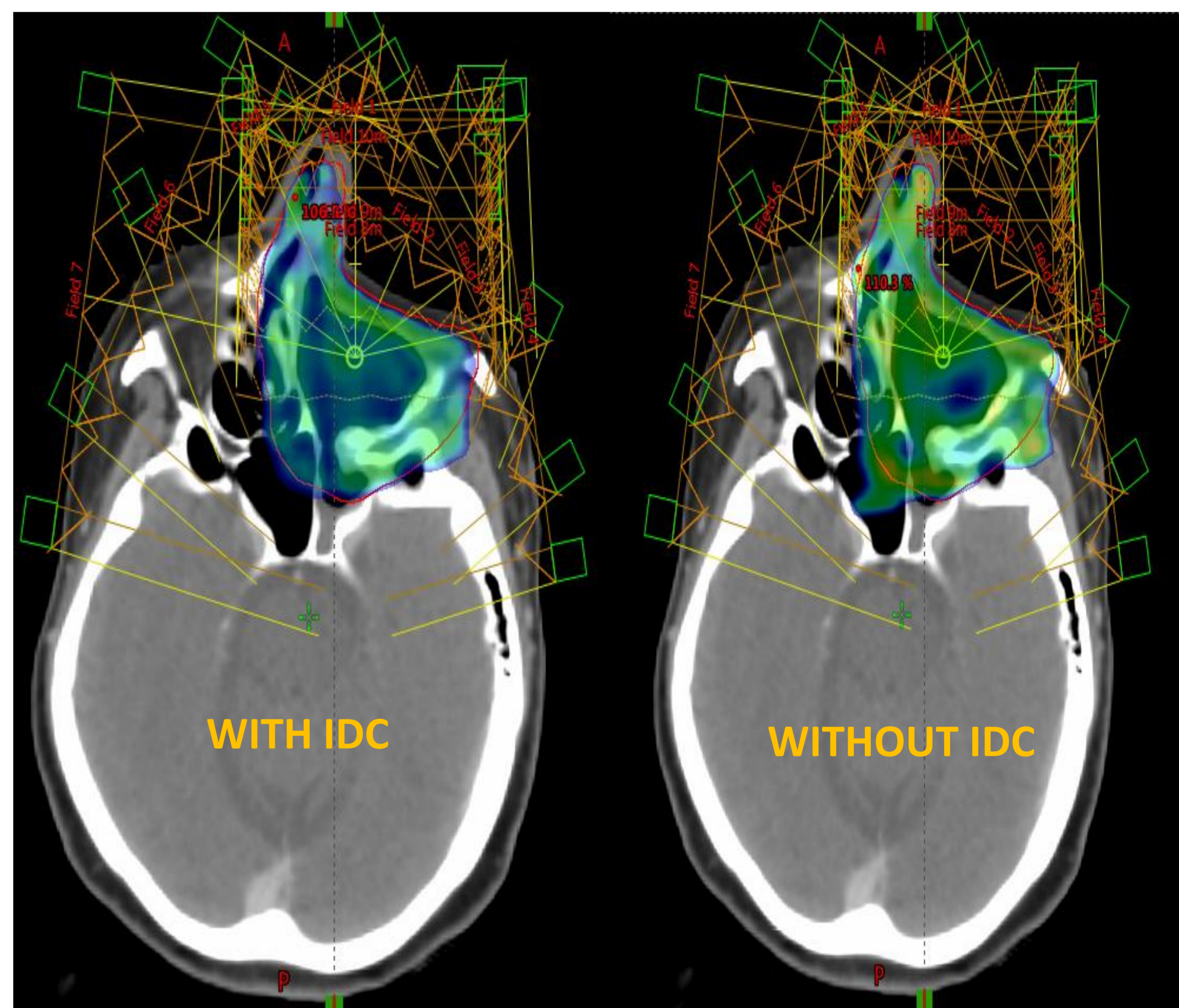
In radiotherapy planning of heterogeneous regions, differences which negatively affect the quality of the plan in terms of homogeneity and conformity may occur between the optimal dose volume histogram (DVH) and the final calculated DVH. The intermediate dose calculation (IDC) module, which is included in the Analytical Anisotropic Algorithm (AAA), is used even though the planning period is slightly increased in radiotherapy plans of lung tumors with low tissue density to reduce these differences. The purpose of this study is to examine the impact of IDC on radiotherapy planning for the heterogeneous maxillary sinus region.

Methods

In this study, the homogeneity index (HI) and the conformity index (CI) values of the intensity modulated radiotherapy plans prepared using Eclipse-TPS and AAA v8.9 of 12 patients with maxillary sinus cancer were calculated. The original plans were re-optimized with the same optimization criteria by using AAA v15.1 with and without IDC. HI and CI values of the new plans were calculated after re-optimization. The HI and CI values, maximum doses and the critical organ doses were compared between the original and new plans.

Results

AAA v15.1 with IDC increased the plan quality in terms of HI, CI and maximum dose values. The HI values (ideal value=0) were found to be 0.093, 0.090 and 0.067; the CI values (ideal value=1) were found to be 1.149, 1.142 and 1.055; the maximum doses were found to be 108.1%, 107.8% and 105.3% for AAA v8.9, AAA v15.1 without IDC and AAA v15.1 with IDC, respectively. The differences between AAA v15.1 with IDC and the others are statistically significant for HI values, CI values and maximum doses but there is no significant difference for the doses received by critical organs.



$$HI = (D\%2 - D\%98) / D\%50$$

$$CI_{RTOG} = \text{Reference Isodose Volume} / \text{Target Volume}$$

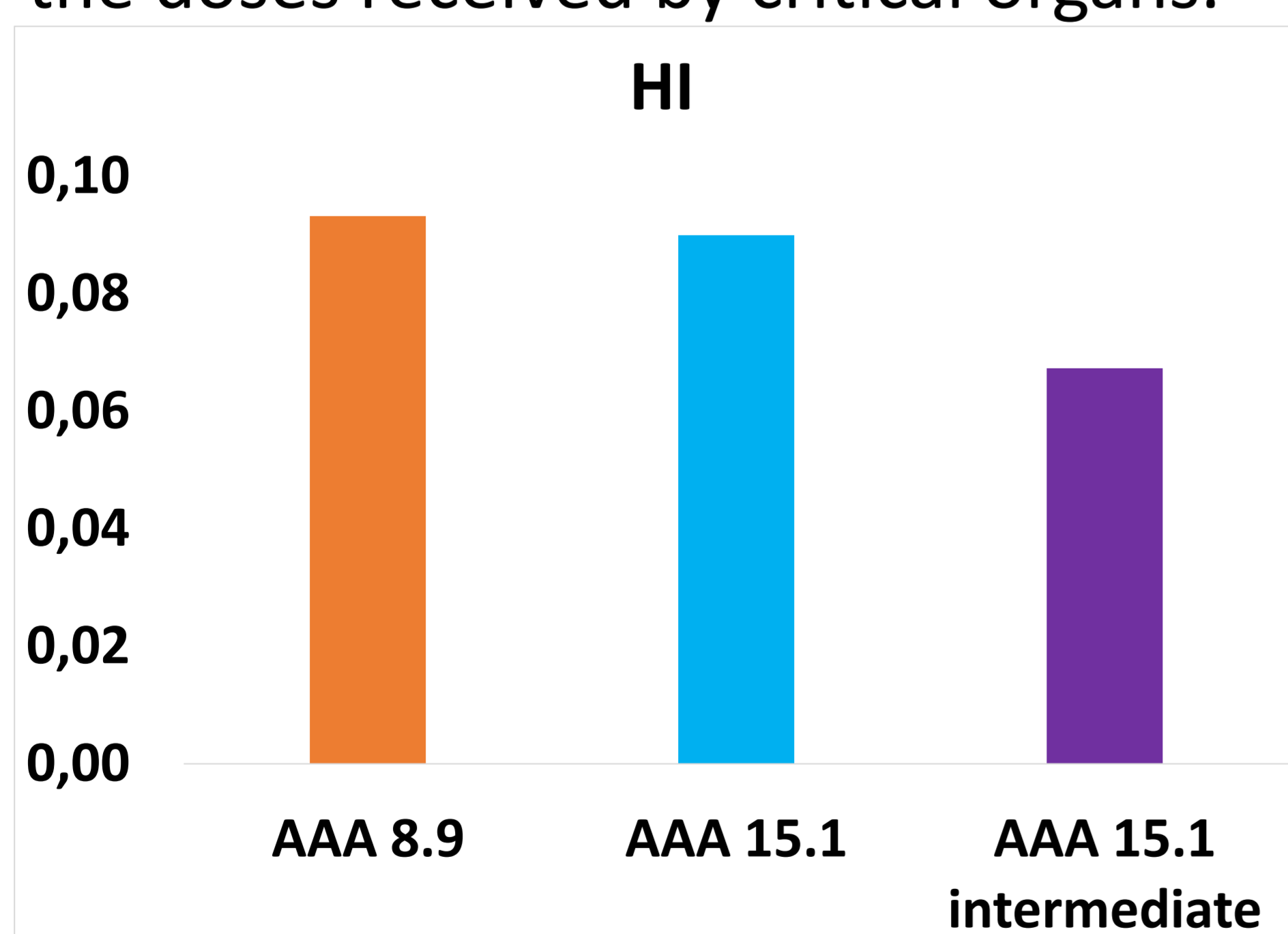


Table 1. HI and CI values

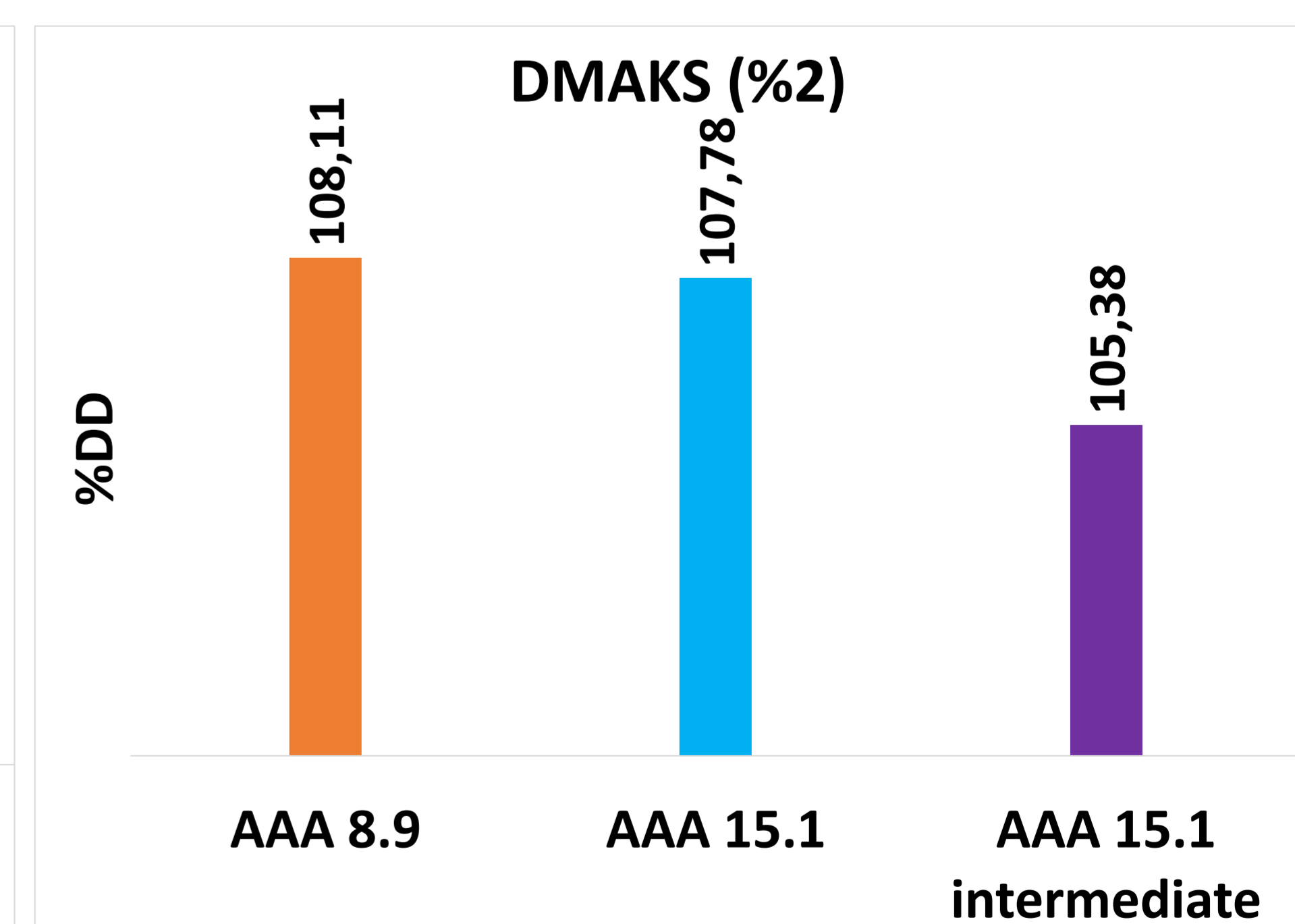
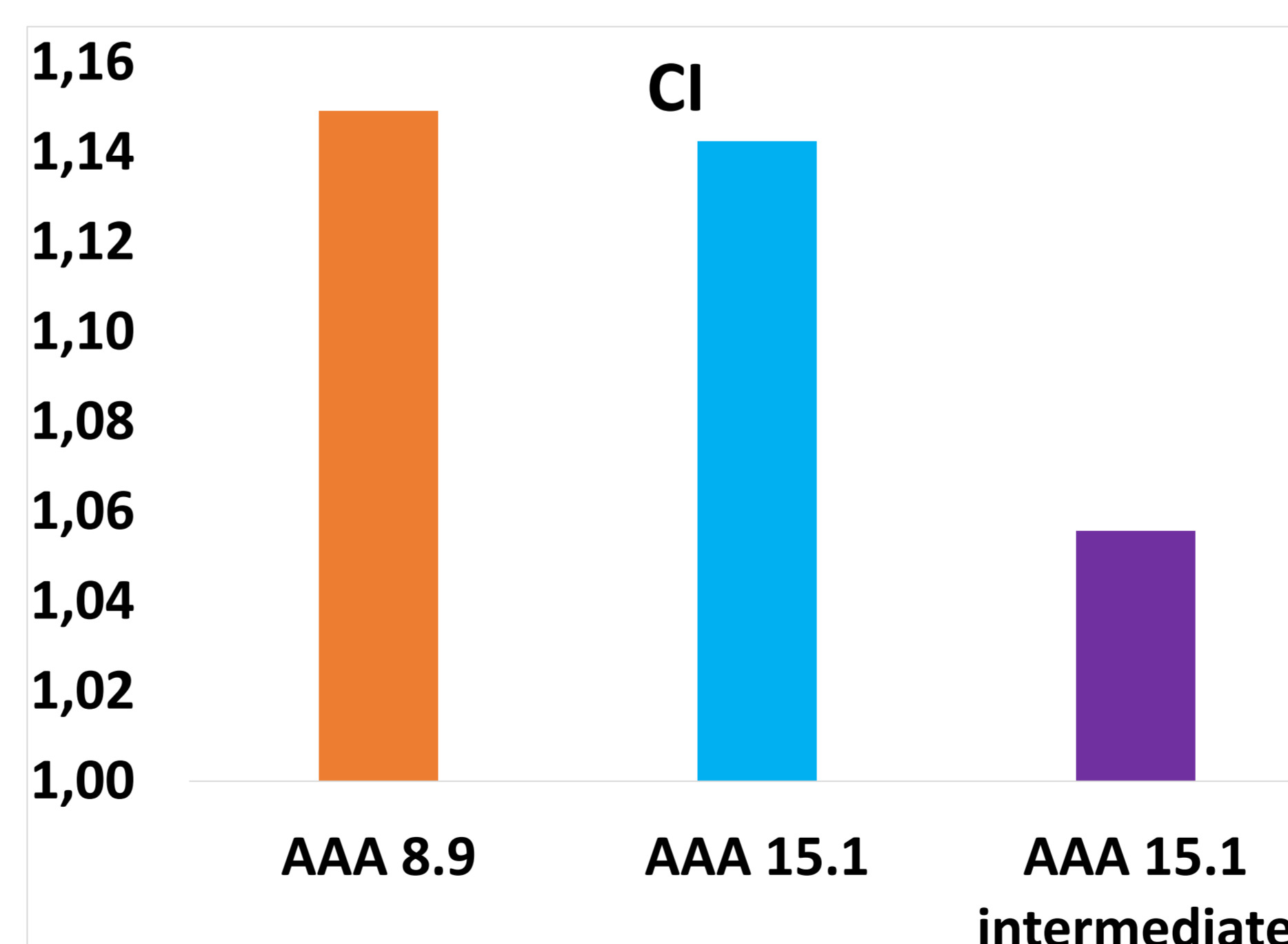


Table 2. Maximum dose values

Conclusions

The use of the IDC increases the quality of intensity modulated radiotherapy plans in heterogeneous regions such as head and neck region.