Purpose:Rotational IMRT for HNC raises new challenges regarding the dose homogeneity within the PTV, and the dose delivered to the non-tumour tissue (NTT).
The purpose of this study is to:
1. develop a new parameter to assess PTV dose homogeneity.
2. evaluate the impact of the physicist's experience on the dose conformity to the PTV and containment away from the PTV.
3. calculate the resulting integral dose (ID), and subsequently propose an optimisation method using the ID as primary endpoint.

Methods:Ten locally-advanced HNC cases were contoured according to the EORTC-RTOG consensus. DICOM studies were sent to 9 TomoTherapy European users. Planning was performed to 50Gy prophylactic dose and 70Gy therapeutic dose.

Results:
1. The improvement in dose homogeneity achieved by each plan was calculated with respect to a reference DVH (minimally compliant with the ICRU-62 requirements), using an AUC calculation. Hi-ART planning increased dose homogeneity by 44 to 82%.
2. Dose conformity to the PTV was quantified by the Overlap Ratio (OR) and Dice Similarity Coefficient (DSC). Experienced users achieved higher conformity, i.e. 0.75 to 0.80 OR values and 0.85 to 0.90 DSC values.
3. Dose containment outside the PTV was evaluated by the Dose Gradient (DG). Experienced TomoTherapy users achieved sharper dose fall-offs (2.5%/mm for bilateral volumes).
4. Improvement in dose conformity and fall-off reduced the ID by a mean 20% (up to 30% in some patients).

Conclusions:An AUC calculation assesses the IMRT-related improvement in dose homogeneity, allowing separate analysis of the under- and overdosage regions.
Dose to the NTT is a challenge. Experience in IMRT planning allows a consistent 20% decrease in ID. OR, DSC and DG have to become primary endpoints during optimisation. Further trials investigating rotational IMRT should encompass these parameters, as undisclosed discrepancies in ID will impact on treatment outcome and patient late complications.