Purpose: To assess the selection of the minimal vertex beam angle for the avoidance of organs at risk (OARs) in radiotherapy planning of brain tumors.

Methods: Seventy patients with intracranial tumors were studied. Three field conformal plans with co-planar or non co-planar beam arrangements with an anterior vertex beam were used. Two methods were studied for determining the vertex angle for avoidance of eye as organ at risk. In the standard technique, the beam’s eye view (BEV) was used to determine need of vertex beam. For the vertex beam, the angle was approximated to avoid eyes. In the second method, the angle from the base-plate to the posterior surface of the head and the angle from the posterior surface of the head to the inferior-most extent of the head were measured from sagital view. The minimum vertex angle required was calculated as the complement of the sum of these angles. The dose volume histogram parameters were maintained.

Results: Depending on the spatial location of the planning target volume with reference to the eyes, patients were classified into 4 types: no overlap; overlap with eye anteriorly; overlap with eye posteriorly, overlap with eye anteriorly and posteriorly. No additional angulation, positive vertex and negative vertex angles were needed for type 1, 2 and 3 respectively. The angle subtended by the isocenter to the neck rest apex was the required vertex angle for type 4.

Of the 36 type 2, 3 and 4 patients the planned vertex angle was more than the calculated vertex angle by over 5 degrees in 10 patients, and less by over 5 degrees in 4 patients.

Conclusions: A simple method for deriving the minimal vertex beam angle for OAR avoidance in radiotherapy planning of intracranial tumors was described and validated.