Dosimetric accuracy of CyberKnife Stereotactic Radiosurgery for Perioptic lesions

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Purpose:
This study aimed to evaluate the dosimetric accuracy of Cyberknife (CK) for benign perioptic tumor using patient specific QA head phantom.

Materials and Methods:
Patient specific head phantoms was fabricated using a 3D-printer to be dosimetrically equivalent to actual target regions of benign perioptic tumor case treated via Cyberknife radiosurgery.
Using the patient specific QA head phantom, film dosimetry was performed for Cyberknife beam delivery. The measured results were analyzed with the gamma passing rates (GPRs) of 2%/1 mm criteria, by comparing with the calculated dose via the ray-tracing algorithms of the MultiPlan Treatment Planning System (version 5.6). After moved rotating (1 degree) and translating (1-5mm) the couch table prior to beam delivery, we checked the 6D skull tracking accuracy according to the beam irradiation. Phantom QA plan was produced using the original CK contour set (target and optic nerve).

Results:
GPRs were greater than the acceptance criteria 80% for all film measurements with the patient specific QA head phantoms in CK perioptic tumor QAs. The difference between measured and calculated dose to the optic nerve in contact with the tumor was less than 3%.

Conclusions:
Dosimetric verification with patient-specific head phantoms could be successfully implemented as the evaluation method for CK perioptic tumor radiosurgery delivery.

Keywords:
CyberKnife, perioptic tumor, 6-D skull tracking