

Stereotactic radiosurgery involves the high-dose irradiation of cranial neoplasms delivered in a single fraction. In the 50-plus years since it was first introduced, stereotactic radiosurgery has become a standard of care in the treatment of brain tumors, vascular malformations, functional disorders, and pain. Modern radiosurgery can be performed non-invasively and on an outpatient basis while maintaining an extremely high degree of accuracy. Within the past ten years, the field of radiosurgery has seen numerous technological enhancements including: (1) the development of dedicated devices for stereotactic delivery; (2) the use of relocatable frames to facilitate fractionated delivery; (3) the development of “frameless” approaches; and (4) the application to extracranial tumor sites. Each of these developments has been accompanied by its own challenges in assuring targeting and dosimetric accuracy. In this presentation we review the technologies for stereotactic localization and treatment of cranial targets with particular emphasis on the quality assurance aspects associated with establishing and maintaining a clinical radiosurgery program. Specifically, the presentation will:

1. Differentiate the technologies used in the delivery of stereotactic radiosurgery including linac-based techniques (both conventional and robotic) and the Gamma Knife.
2. Define the treatment planning parameters for linac-based and Gamma Knife stereotactic radiosurgery.
3. Discuss measures for assuring accuracy in stereotactic localization and dose delivery for linac-based and Gamma Knife stereotactic radiosurgery.