Cavernous sinus meningioma radiosurgery

Studies highlight the efficacy of SRS in the treatment of meningiomas restricted to the parasellar space. However, for symptomatic meningiomas that are either confined within the CS or that are invading the CS from another primary site, resection and decompression remain a viable treatment modality.

Articles published from January 1963 to December 2014 were systemically reviewed. Three electronic databases, PubMed, EMBASE, and The Cochrane Central Register of Controlled Trials, were searched. Publications in English with at least 10 patients (each arm) were included.

Of 569 screened abstracts, a total of 49 full-text articles were included in the analysis. All studies were retrospective. Most of the reports had favorable outcomes with 5-yr progression-free survival (PFS) rates ranging from 86% to 99%, and 10-yr PFS rates ranging from 69% to 97%. The post-SRS neurological preservation rate ranged from 80% to 100%. Resection can be considered for the treatment of larger (>3 cm in diameter) and symptomatic CS meningioma in patients both receptive to and medically eligible for open surgery. Adjuvant or salvage SRS for residual or recurrent tumor can be utilized depending on factors such as tumor volume and proximity to adjacent critical organs at risk.

The literature is limited to level III evidence with respect to outcomes of SRS in patients with CS meningioma. Based on the observed results, SRS offers a favorable benefit to risk profile for patients with CS meningioma [1)].

Park et al., from Seoul, Korea, Stanford University, California. Tianjin China; University of Pittsburgh, Pennsylvania, New York University Langone Medical Center, retrospectively assessed treatment outcomes 5-18 years after SRS in 200 patients with Cavernous sinus meningioma (CSM). The median patient age was 57 years (range 22-83 years). In total, 120 (60%) patients underwent Gamma Knife SRS as primary management, 46 (23%) for residual tumors, and 34 (17%) for recurrent tumors after one or more surgical procedures. The median tumor target volume was 7.5 cm3 (range 0.1-37.3 cm3), and the median margin dose was 13.0 Gy (range 10-20 Gy).

Tumor volume regressed in 121 (61%) patients, was unchanged in 49 (25%), and increased over time in 30 (15%) during a median imaging follow-up of 101 months. Actuarial tumor control rates at the 5-, 10-, and 15-year follow-ups were 92%, 84%, and 75%, respectively. Of the 120 patients who had undergone SRS as a primary treatment (primary SRS), tumor progression was observed in 14 (11.7%) patients at a median of 48.9 months (range 4.8-120.0 months) after SRS, and actuarial tumor control rates were 98%, 93%, 85%, and 85% at the 1-, 5-, 10-, and 15-year follow-ups post-SRS. A history of tumor progression after microsurgery was an independent predictor of an unfavorable response to radiosurgery ($p = 0.009$, HR = 4.161, 95% CI 1.438-12.045). Forty-four (26%) of 170 patients who had presented with at least one cranial nerve (CN) deficit improved after SRS. Development of new CN deficits after initial microsurgical resection was an unfavorable factor for improvement after SRS ($p = 0.014$, HR = 0.169, 95% CI 0.041-0.702). Fifteen (7.5%) patients experienced permanent CN deficits without evidence of tumor progression at a median onset of 9 months (range 2.3-85 months) after SRS. Patients with larger tumor volumes (≥ 10 cm3) were more likely to develop permanent CN complications ($p = 0.046$, HR = 3.629, 95% CI 1.026-12.838). Three patients (1.5%) developed

delayed pituitary dysfunction after SRS.

This long-term study showed that Gamma Knife radiosurgery provided long-term tumor control for most patients with CSM. Patients who underwent SRS for progressive tumors after prior microsurgery had a greater chance of tumor growth than the patients without prior surgery or those with residual tumor treated after microsurgery [2].

The medical records and imaging and procedural reports of 166 patients with CSM from the Skull Base Research Center, Hazrat Rasoul Akram Hospital, Iran University of Medical Sciences, Tehran were retrospectively reviewed. Demographic data, procedural data, symptomatic improvement, radiological regression, and progression-free survival (PFS) rates were evaluated.

There were 124 women and 42 men; including 44 postoperative and 122 primary GKRS cases. Mean follow-up was 32.4 months. Mean marginal dose was 13 Gy. Symptomatic improvement was seen in 40.4%, while neurologic deterioration occurred in 9.6%; 50% remained symptomatically stable. Radiological regression was noted in 57.2%; the tumor remained stable in 35.5%, and 7.2% of the patients experienced tumor progression. The actuarial 5- and 10-year PFS rates were 90.1% (±3.3) and 75.8% (±8.8), respectively. History of previous surgery or radiotherapy were associated with lower symptomatic improvement. Higher tumor coverage and isodose lines were accompanied with better radiological prognosis. However, a history of conventional radiotherapy, presence of facial sensory deficits at presentation, a higher tumor volume, and tumor extension to the suprasellar compartment affected the radiologic outcome negatively.

This study revealed a high efficacy and safety for GKRS in both postoperative and primary GKRS patients. Achievability of a good profile of tumor coverage and isodose lines at radiosurgical planning predict a better outcome [3].

1)
Lee CC, Trifiletti DM, Sahgal A, DeSalles A, Fariselli L, Hayashi M, Levivier M, Ma L, Álvarez RM, Paddick I, Regis J, Ryu S, Slotman B, Sheehan J. Stereotactic Radiosurgery for Benign (World Health Organization Grade I) Cavernous Sinus Meningiomas-International Stereotactic Radiosurgery Society (ISRS) Practice Guideline: A Systematic Review. Neurosurgery. 2018 Dec 1;83(6):1128-1142. doi: 10.1093/neuros/nyy009. PubMed PMID: 29554317.
2)
Park KJ, Kano H, Iyer A, Liu X, Tonetti DA, Lehocky C, Faramand A, Niranjan A, Flickinger JC, Kondziolka D, Lunsford LD. Gamma Knife stereotactic radiosurgery for cavernous sinus meningioma: long-term follow-up in 200 patients. J Neurosurg. 2018 Jul 20:1-10. doi: 10.3171/2018.2.JNS172361. [Epub ahead of print] PubMed PMID: 30028261.
3)
Azar M, Kazemi F, Jahanbakhshi A, Chanideh I, Jalessi M, Amini E, Geraily G, Farhadi M. Gamma Knife Radiosurgery for Cavernous Sinus Meningiomas: Analysis of Outcome in 166 Patients. Stereotact Funct Neurosurg. 2017;95(4):259-267. doi: 10.1159/000478024. Epub 2017 Aug 11. PubMed PMID: 28797005.