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Abstract

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A Brief Overview of Meningioma and Gamma Knife Surgery (GKRS)

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Abstract

Objectives:

Meningioma history dated back to pre historic era in Peruvian Andes. Felix Platter (1614) first described meningioma. Harvey Cushing (1922) used the term meningioma and documented 85 cases. First Gama knife surgery (GKRS) was introduced by Leksell (1968) in Sweden. GKRS is a therapeutic alternative to aggressive surgical treatment with high efficacy and tolerance show success in meningioma treatment. In this context, this researcher likes to observe most recent outcomes of GKRS in meningioma treatment with a brief overview of meningioma.

Methods:

History of meningioma and GKRS is reviewed from PubMed journals. Observation focused on overview of meningioma including risk factors, epidemiology, etiology and treatment by GKRS. GKRS scanned for dose to indication, failure to complications and follow ups reports.

Results:

Findings for meningioma are as follows: Incidence rate: Among intracranial and CNS tumors meningioma has highest incidence rate (37.6%). Gender: Meningioma grade 1 and 2 are more common in females than men (2-3:1); Aggressive in male. Race: More common among Africans (3.1/100,000) than Caucasians. Age: Peak age 6th -7th decades. Origin of meningioma: From leptomeninges of arachnoid cap cells. Location and number: 85- 90% supratentorial; 8% cases multiple in numbers (hallmark for NF2).Etiology: There are several etiological factors as follows: Ionizing radiation is common cause even present in atomic bomb survivors. Genetic cause: Commonly associated with Neurofibromatosis 2 (NF2). NF2 mRNA in blood considered as high risk factor. Hormonal cause: Presence of exogenous progesterone and low progesterone receptor (Pr) showed strong association. Cytogenetic: Deletion in long arm of chromosome 22 (70%). Important biomarker: mi RNA.

Gamma Knife treatment and dose: It may require 5-10 years to see the visibility of the treatment. For success several points to be noted including WHO classification, size of the tumor (smaller size 3cm3), location of the tumor, radiation dose (10-15 Gy), age, last tumor resection time etc. Dose differs for eloquent areas like optic pathway (8 Gy), brainstem (14 Gy) and pituitary gland (15 Gy). Fractionated multi session procedures (4-10 Gy 2-5 session; total 18-25 Gy) followed for last few years like skull base meningioma (perioptic meningioma). Indication for SRS surgery includes elderly, sick patients where surgeries cannot be performed, well defined, small tumors, risk of damaging of cranial nerves, convexity of the brain. Treatment failure observed when tumor size bigger than 10 cm3, patients below 40 years of age, male, radiation dose below 12 Gy (relapses are common), surgical resection time 6 months. Complications developed in 2.5-10% cases following treatment which include edema (18%) 6-7 months after treatment common in bigger tumor size (>10 cm3), worsen in 40% cases of preexisting edema in one study. Others include cranial nerve damage / palsy, hemiparesis, speech difficulty etc. Outcome of successful treatment includes improvement of headache, vertigo, seizures (↓ Ca level), trigeminal and cranial symptoms. In first year of follow up, 71% show progress free survival (PFS) which reduced next years among studies. In skull base meningioma cranial nerve function deterioration occurs in 10% cases in following 10 years. Local tumor controls achieved in 10 years follow up 87.8%. Median relapse time was 5.4 years. 72% required no further treatment. Higher prescription dose (>13 Gy) was found lower relapses.

Conclusion(s):

Following invention of GKRS over half century constitute large data sets, observations, series studies able to predict significant benefits of GKRS use in meningioma cases. Mortality reduction, avoidance of aggressive

and difficult to operate cases is of successes.
Longitudinal follow up is required. Needs thoughtful setting of prescription dose can reduce relapses, edema and other complications.