Linear accelerator radiosurgery

Indications

Stereotactic radiosurgery with an adapted linear accelerator (linac-SRS) is an established therapy option for brain metastases, benign brain tumors, and arteriovenous malformations.

It could constitute an effective and safe therapeutic alternative for drug-resistant trigeminal neuralgia. However, existing studies leave important doubts as to optimal treatment doses or the therapeutic target, long-term recurrence, and do not help identify which subgroups of patients could most benefit from this technique ¹⁾.

Linear accelerator radiosurgery for vestibular schwannoma

Case series

Between September 2003 and November 2009 fifty consecutive patients with VSs treated with SRS using a marginal dose of 12.5 Gy utilizing a LINAC equipped with a micro-multileaf collimator were identified. Evaluation included serial magnetic resonance imaging (MRI), and neurological and hearing examinations.

The median tumour volume at treatment was 2.4 (range: 0.24-10.59) cm3. The intracranial diameter of the tumours ranged between 7.7 and 28.7 (median: 15.8) mm. Follow-up MRI was available for analysis on 49 patients. The median radiological follow-up period was 5.8 (range: 1.4-9.2) years. The median tumour volume at last follow-up was 1.1 (range: 0.03-5.3) cm3. VS decreased in size in 45 (90%) patients, with a median reduction in tumour volume of 1.46 (range: 0.06-9.29) cm3 or a median tumour size reduction of 59% of the baseline (range: 6-90%) in these patients. VS remained stable in 2 patients and increased in size in 2 patients. Only 1 patient (2%) required additional intervention (surgery). 15 patients had useful hearing pre-treatment; 10 post-treatment pure-tone audiograms of these patients were available. 5 (50%) patients still had useful hearing post treatment. Non-auditory adverse radiation effects included new (House-Brackmann grade II) or worsened facial nerve palsy (House-Brackmann grade II to grade V) in 2 (4%) patients and trigeminal sensory disturbance in 2 (4%) patients.

At medium term, the vast majority of VSs treated with LINAC-based SRS exhibit tumour shrinkage. The slightly higher rate of facial nerve palsy compared with Gamma knife radiosurgery (GKS) results may be related to the learning curve. Other complications were similar to reported GKS results for VSs of comparable sizes ².

Linear accelerator versus CyberKnife

Dosimetric quality of treatment plans achieved with a CyberKnife (CK) clearly demonstrate the superiority of the irradiation plan for CK compared to classical linac-SRS with circular collimators and microMLC. In particular, the average minimal target volume dose per patient, increased by 1.9 Gy, and at the same time a 14 % better conformation index seems to be an improvement with clinical relevance ³⁾.

1)

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2)

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