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Letter to the Editor

Acute and subacute sensorineural hearing loss after radiosurgery for vestibular schwannomas: Avoiding what is avoidable!

Dear Editor,

We read with great interest the article of Wu et al. [1] regarding acute sensorineural hearing loss in patients with vestibular schwannomas (VS) early after fractionnated Cyberknife radiosurgery (RS). The reported prevalence was 8.6% as considered in the first 6 months after RS. Hearing improvement was noted in only one patient after 3 months time. The authors postulate that this is related to damage to the cochlear nerve. Furthermore, they postulate that tumors measuring less than 1.45 cm with serviceable hearing should be observed. For larger tumors, including medium-size ones, RS should be considered the first line therapy.

The issue of acute and subacute complications after RS for VS is an important topic, independently of the used radiosurgery device. In our experience [2,3], we encountered not only acute sensorineural hearing loss, as the authors do report here [1]. As early as 2016, we published an article [2] discussing the appearance of what we named adverse radiation events (ARE), during the first 6 months after Gamma Knife radiosurgery (GKR). In a much larger cohort of 159 patients, treated with uniform doses of 12 Gy in single fraction GKR, the incidence of ARE was as high as 22%. The mean time of installation was 37.9 days. In patients with de novo symptoms the most common were vertigo and gait disturbance. Exacerbation of a pre-existing symptom was mostly related to hearing loss. All patients benefitted from a corticosteroid treatment. Permanent morbidity was as low as 1.9%. In patients with acute sensorineural hearing loss, the vast majority recovered after corticosteroids.

Wu et al. [1] discuss the pathophysiological mechanism of hearing loss. They conclude that the potential damage to the cochlear nerve is responsible for the acute onset hearing loss. One should keep in mind that the dose to the cochlea was already reported, as early as 2007, as one of the major predictors for hearing preservation after RS, for the particular case of GKR [4]. The general recommendation is to keep this dose below 4.2 Gy as a maximum cut-off for single fraction RS [5]. In Cyberknife RS, Gephart et al. [6], discussed the issue of the corresponding cochlear dose for fractionated RS to prevent hearing deterioration after RS. Controlling for differences in cochlear volume among subjects, each additional mm3 of cochlea receiving 10 to 16 Gy (single session equivalent doses of 6.6–10.1 Gy) significantly increased the odds of hearing loss by approximately 5%. As a general aspect, in GKR, the particular steep gradient allows protecting the cochlea even in VS which go far into the fundus, with little space between the tumor and the cochlea, as low as 2–3 mm (Fig. 1) [2,7]. We continue to believe that the dose to the cochlea is a major predictor of hearing preservation, due to the large body of evidence discussing this issue. Moreover, in the undesired event of acute sensorineural hearing loss, one should apply an urgent corticosteroid treatment, of one-week duration, which in our experience helped the vast majority of patients to recover. We additionally discussed the potential pathophysiological mechanisms of vestibular symptoms appearance in early setting after GKR. In fact, a vestibular dose of more than 8 Gy was thought to play a role [2].

Wu et al. discuss the complex issue of wait-and-scan policy versus proactive treatment for VS, including their own cut-off of VS measuring less than 1.45 cm for applying this former strategy. This is a subject of major debate in the literature, much more related to intracanalicular tumors (e.g. less than 1 cm diameter). Régis et al. [8] have suggested as early as 2010 that wait-and-see policy exposes the patients with these type of VS to elevated risk of growth and hearing degradation. This information must be also presented to the patient. In our opinion, much larger cohorts and randomized controlled trials could help finding the answer to whether small tumors with preserved hearing should be treated or not proactively. The present trial of Wu et al. [1] might draw, in this sense, strong conclusions with regards to their restablished cut-off of 1.45 cm. In our institution, we offer RS to patients with small-to-medium size tumors. We discuss the individual patient's case and correctly present all the available options, including the wait-and-scan policy. In cases of large tumors, with symptomatic mass effect, we perform a combined approach, with planned subtotal resection and GKR on the postoperative remnant [9,10].

In conclusion, studying the early possible complications of RS for VS is an important topic. One has to keep in mind the major dosimetric predictors, which might generate such clinical effects. The dose delivered to the cochlea remains a chief and established factor for hearing loss after RS for VS. Corticosteroid treatment might be extremely beneficial, as already published by our group. In the absence of randomized controlled trials and larger cohorts, drawing strong conclusions on which patients to treat depending on their initial hearing status and tumor size remains a matter of debate, especially for intracanalicular VS.

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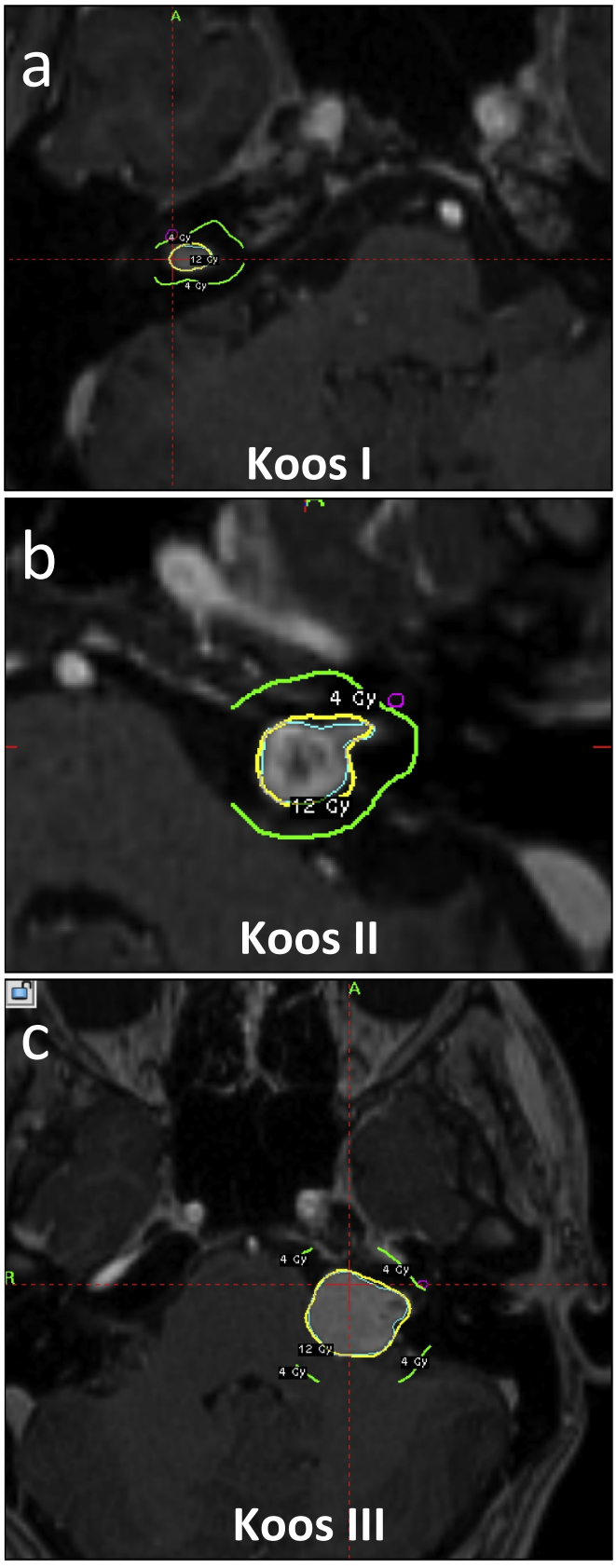

Fig. 1. Examples of Gamma Knife radiosurgery treatment for Kooss grade I, II, and III VS. The dosimetry line is in yellow, the 4 Gy isodose line corresponding to the cut-off for the maximal cochlear dose is coloured in green, while the cochlea itself is coloured in magenta. One can see that due to the steep GKR gradient, a distance of just 2–3 mm between the tumor and the cochlea allows delivering a safe dose to the cochlea, while prescribing a uniform single fraction dose of 12 Gy. (For interpretation of the references to colour in this figure legend, the reader is referred to the web version of this article.)

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