Letter to the Editor

Stereotactic Radiosurgery with the CyberKnife for Pituitary Adenomas

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To the Editor : It was a pleasure to read another of your outstanding issues.

I write regarding the following article, “Stereotactic Radiosurgery with the CyberKnife for Pituitary Adenomas” by Cho et al., J Korean Neurosurg Soc 45 : 157-163, 2009.

It is always a pleasure to see additional articles that help to define the role of radiosurgery as a primary or adjuvant management strategy for brain tumors such as pituitary adenomas. Cho et al. have presented their experience in 26 patients with an average follow-up of 2.5 years. The authors note endocrinological improvement (undefined) in nine functioning adenoma patients. While such preliminary data is of interest, the benefit of radiosurgery, like microsurgery, must be defined by normalization of hormonal values. The brief report on hormonal function does not define the methodology used to assess endocrine function, or the actual values which will indicate normalization of the hormonal values (noted in four of nine patients). More importantly, the authors espouse their use of CyberKnife, and note in their discussion section several purported disadvantages of another technology, the Gamma Knife. They note that the Gamma Knife requires “Cobalt reload”, a feature which is required in order to do. In contrast, the CyberKnife, a photon delivery system using a Linac, frequently requires extensive quality assurance and technical support, necessitating very high cost maintenance agreements for individual sites. It is true that the gamma knife requires a head frame for interface between the imaging and the treatment delivery. This is, in fact, only one means of assuring accuracy, which is based on the ability to do high resolution anatomic imaging with the frame on (MRI in most cases, in contrast to CyberKnife which most commonly uses poor resolution CT scan imaging), but also because of the 0.1 mm. robotic delivery of the target into the intersection of the photon beams generated by the Cobalt sources. It is for this reason that the instrument accuracy is 0.1 mm. The authors state that the Gamma Knife has major drawbacks “when treating patients with multiple, large, or non-spherical tumors”. This is completely inaccurate, as in fact the Gamma Knife, especially using the current generation, Perfexion Unit, was specifically re-designed in order to be able to efficiently and effectively treat multiple, large, and non-spherical tumors (which is in fact the rule for virtually all brain tumor patients).

Finally, the authors indicate that the Gamma Knife has no real-time imaging capability implying a deficiency in the system. In fact, the CyberKnife has no real time imaging capability either, but it instead is a “point and shoot” technology, requiring that imaging be done, followed by verification of accuracy, followed by delivery of radiation. The author’s paragraph of description seems disingenuous, and simply parrots marketing information widely disseminated by the Accuray Company. It Would be advantageous for the authors to visit a treatment center currently using a Gamma Knife in order to better understand the differences between CyberKnife radiosurgery and Gamma Knife radiosurgery, and the fallacies in their discussion of the purported disadvantages of the Gamma Knife compared to the CyberKnife.

I remain with best personal regards.

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Response : I am grateful to you for presenting your opinions on my paper. At the same time, I greatly appreciate the contribution you have contributed to radiosurgery during the past thirty years.

By the way, I would like to point out your errors in the letter to the editor. I am afraid the most serious error is your comment on the comparison between GammaKnife and CyberKnife. In fact, such comparison does not constitute
an important part in my study. The core of my study is to show the usefulness of the CyberKnife on pituitary adenoma. Indeed, I have no clinical experience on GammaKnife, but I refer to the papers published so far.

The following are my answers to your opinions.

First, you pointed out my endocrinological methodology. However, my methodology clearly includes the criteria on endocrinological improvement and hormonal normalization. They were also used in other papers on the treatment of pituitary adenoma. As you see, Fig. 3 and Fig. 4 contain the graphs illustrating the changes in the course of follow-up according to actual hormonal value.

Second, you questioned my comment on the shortcomings of GammaKnife. However, my comment can be also mentioned in other papers that refer to the shortcomings on GammaKnife. My current study indicates cobalt reload, head frame fixation, being used to cranial lesion alone and not being easy to treat multiple, large or non-spherical tumors. My study does not argue that CyberKnife is superior to GammaKnife. The study merely refers to it as important that CyberKnife can easily apply, especially, fractionation among the shortcomings of GammaKnife. In terms of not being easy to treat multiple, large or non-spherical tumors, I believe that the 1200-plus beams of nonisocentrically targeted radiation of the CyberKnife versus the 201 isocentrically targeted beams of the GammaKnife offer the potential for much greater dose homogeneity with the CyberKnife than with the GammaKnife. The above-mentioned contents have been referred to by many authors. I also know well that the PerfeXion Unit, an advanced generation of GammaKnife, has substantially solved such problems and is used for treatment. However, you seem to overlook that the GammaKnife of the previous generation is widely used in medically advanced countries as well as Korea and more used in clinical fields than the PerfeXion Unit. My opinions are directed toward the GammaKnife currently used, not the most advanced GammaKnife (PerfeXion Unit). In practice, it was not until November 2008 that the PerfeXion Unit was introduced for the first time in Korea, showing it is not yet widely used around the world.

Third, you referred to accuracy. In fact, I did not present any accuracy of GammaKnife and CyberKnife. I merely indicated that the alignment of headframe fixation can contribute to target precision of Gammaknife, which is self-evident, I think. As there are influence factors on the precision of GammaKnife, so there are those of CyberKnife.

Fourth, if the real-time image of CyberKnife is defined as “point and shoot”, not real-time image in real sense, I would like to ask you to which extent the real-time image can be embodied by the current medical technology. In terms of the real-time image available in the current medical technology, I judge the real-time image of CyberKnife to be a more advanced technology in radiosurgery.

I remain with best personal regards
Yours sincerely

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