GRAPHICAL CALCULATION OF THE TARGET PLANE MAGNIFICATION FACTOR IN RADIOSURGERY OF ARTERIOVENOUS MALFORMATION

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A simple and accurate graphical method for calculating the magnification factors of a target lesion on stereotactic-framed orthogonal angiographic films has been developed for radiosurgery of arteriovenous malformation. This graphical method can be accurately applied to different orientations of the orthogonal angiography and can be used as a routine double-check tool against computer program.

Key words: stereotactic frame, orthogonal biplane radiography, magnification factor, stereotactic radiosurgery

Veterans General Hospital (VGH)-Taipei treated the first case of arteriovenous malformation (AVM) with Gammaknife stereotactic radiotherapy on March 22, 1993. More than 170 patients of different diagnoses have been treated by the Gamma unit at VGH to date. In the treatment of AVM, a Leksell stereotactic frame is first applied to the patient's skull. Orthogonal biplane angiographic imagings are taken for visualization of the AVM. During the treatment planning, the spatial coordinates of the target in the Leksell frame can be calculated by either graphical method or computer program[1]. Independent data acquisition and different methods of calculation ensure accurate determination of the target's coordinates. The magnification factors of the target, Mt, can be approximately calculated by an equation provided by the equipment manufacturer as the following:

$$\mathbf{M_t = M_p - (M_p - M_d)\ (t/180),} \quad (1)$$

where $\mathbf{M_p}$ and $\mathbf{M_d}$ are the magnification factors of the fiducial scales of proximal and distal frames, respectively, **t** is the distance (mm) between the proximal plane and the plane of the target, and **180** (mm) is the dimension of the Leksell frame. In order to determine t, the exact spatial coordinates of the target have to be calculated first. Because the origin (0,0,0) in the Leksell coordinate system is located outside the Leksell frame at the right upper posterior corner and the frame center is (100,100,100), the **t** for a target of (x, y, z) in the Leksell coordinate system will be different according to the orientation of the

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