An Accurate Method for Angiographic Measurement of Neurovascular Lesion Dimensions

Accurately evaluating the size of a lesion such as an aneurysm is essential for properly devising treatment strategies. The commonly used technique is to measure the lesion size in a radiographic image and correct it with a factor for geometric magnification. A two marker method to calculate the magnification of the lesion by the linear interpolation of two measurable magnification factors on opposite sides of the head has been in use, but can be inaccurate. By deriving the exact formula for calculating magnification at the level of the lesion, the error caused by the linear interpolation method was analyzed. This error was found to depend on the distance between the x-ray focal spot and the head, the location of the lesion in the head, and the head size. The closer the head is to the focal spot and the nearer the lesion is to the center of the head, the larger is the error. For a 20cm head and a source to receptor distance of 100cm, the maximum error is less than 2% when the head is placed 10cm from the image plane. However, the maximum error increases to 10% when the head is 30cm from the focal spot. In conclusion, the exact formula provides a more accurate method than linear interpolation to calculate lesion size. How this and other methods for lesion sizing can be applied in clinical procedures is being explored. (Partial support: US Army Grant DAMD17961687).