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Original Article

Intraoperative Micro-Measurement in Neurosurgical Microsurgery: A Technical Note

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Abstract

Objective: In neurosurgical microsurgery, understanding the accurate size of microstructures is essential to perform operation safely and less invasively. We here describe a simple method of measuring the size of microvessels using a digital image as a microscale. **Materials and Methods:** The digital image was made as a microscale on the computer. We measured the size of intracranial microstructures using the microscale. **Results:** We accurately measured the size of the vertebral artery perforator of 1 mm or less using the adjusted microscale on the computer. **Conclusions:** The development of a microscale is easy and renders the measurement of microstructures, sized 1 mm or less, feasible, and accurate.

Keywords: *Cranial anatomy, microscale, microstructures*

Introduction

It is difficult to accurately measure the size of microstructures (perforators, intracranial nerves, and others) of 1 mm or less in neurosurgical microsurgery. To our knowledge, a measurement method has never been reported. Intracranial structures are very small and the field of microsurgical operation is narrow; therefore, it is not possible to use a ruler. Although we can calculate the size based on surgical tools, this is not an accurate technique.

In microsurgery, understanding the accurate size of microstructures is essential to perform operation safely and less invasively. Furthermore, this can provide detailed information about cranial microanatomy. We here developed a simple method for measuring the size of microstructures of 1 mm or less with accuracy using a digital image as a microscale.

Materials and Methods

Initially, the SHEET GAUZE [Figure 1] and a paper scale [Figure 2] were captured with a scanner as a digital image. The resolution was 1200 dpi. In the SHEET GAUZE, the minimum scale unit was 0.05 mm and the graphic accuracy was within ±0.004 mm. Next, these digital images were arranged in parallel on the computer to compare to each scale [Figure 3]. This digital image was termed "the microscale."

We trimmed the sterilized paper scale to avoid damaging the surrounding brain structures. We placed the scale on the same plane of the structures, the size of which we wished to measure [Figure 4]. When the depth of the structure is different from that of the paper scale, there is a difference in scale under the microscope, so it is important to make it in the same plane. The series of actions were recorded with high-definition video and were imported as still images into the computer.

Using image processing software (Adobe Photoshop, San Jose, CA, USA), the still images and the microscale were aligned on the computer and the scale was adjusted by matching with each paper scale size [Figure 5]. All methods were performed in accordance with the approved guidelines by the Institutional Review Board (IRB #233) at Showa University Hospital. The patient also gave informed consent approved by the IRB at Showa University Hospital for study participation.

Results

We accurately measured the size of the vertebral artery perforator of 1 mm or less using the adjusted microscale on the computer [Figure 6].

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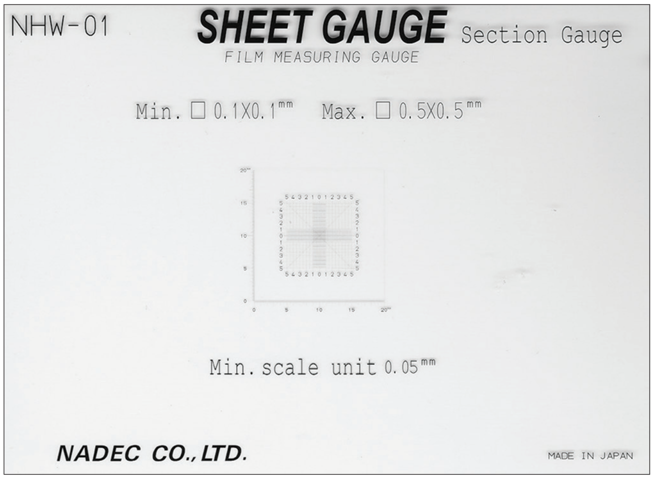

Figure 1: The SHEET GAUZE

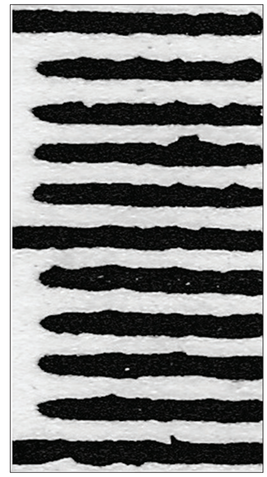

Figure 2: The paper scale

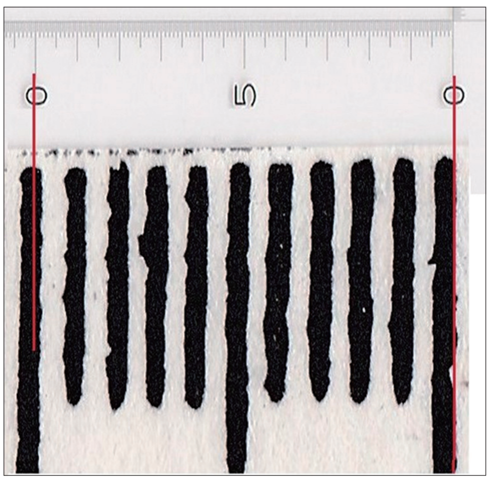

Figure 3: The microscale

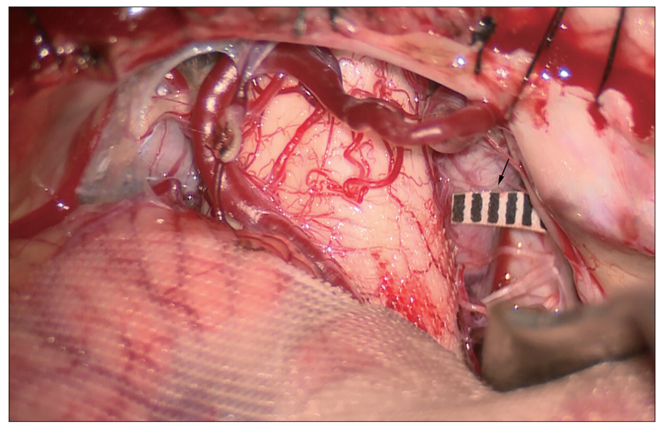

Figure 4: Intraoperative view of left vertebral artery aneurysm clipping. The arrow shows the paper scale placed on the vertebral artery under a surgical microscope

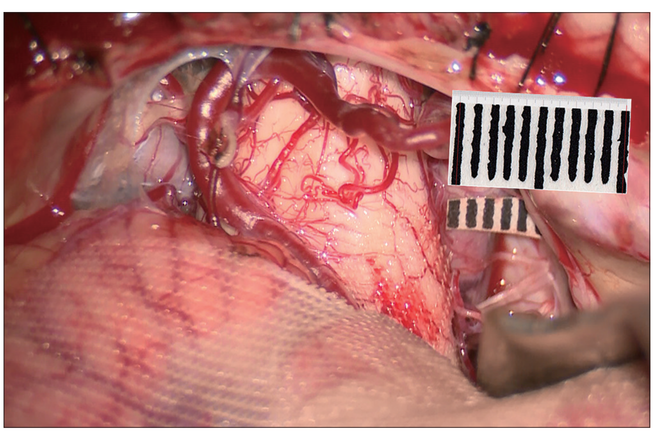

Figure 5: The size of the microscale was adjusted to the paper scale using zoom function of computer

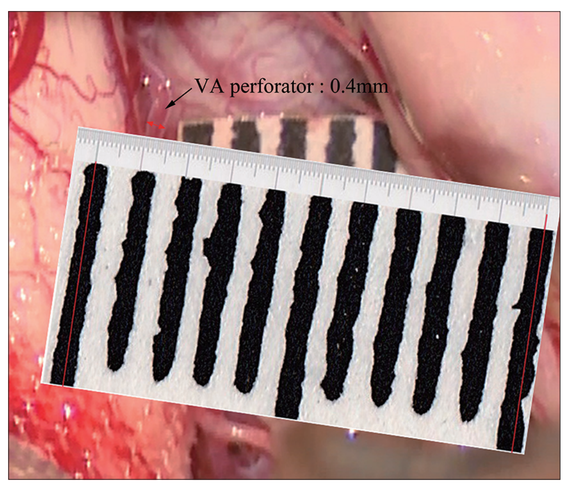

Figure 6: The size of the vertebral artery perforator was measured using the adjusted microscale on the computer. The size of the perforator was 0.4 mm

Discussion

When using a stereomicroscope, the measurement of the object takes place using an ocular or an objective micrometer.[1,2] However, these micrometers cannot be used with a surgical microscope. At the present time, any surgical microscope company has never built microscales into the view for precise measurement. Unfortunately, this study was in *post hoc* processing. We believe that this report can promote further studies using *priori* imaging-based segmentation and measurements.

Our method uses nonspecialized computer and scanner equipment and does not require an extensive knowledge of computer graphics. It is possible to freely change the size and angle, making the measurement easier, with digital image processing. Regarding structures other than objects, it should be noted that even though they appear to be on the same plane on the digital image, accurate measurements cannot be performed due to differences in depth. Using this method, it is possible to obtain accurate measurement data about intracranial microstructures that could be useful in clinical practice and research.

Conclusions

The development of a microscale is easy and renders the measurement of microstructures, sized 1 mm or less, feasible, and accurate.

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Nil.

Conflicts of interest

There are no conflicts of interest.

References

1. Ogon I, Takebayashi T, Miyakawa T, Iwase T, Tanimoto K, Terashima Y, *et al.* Suppression of sympathetic nerve sprouting by local administration of an α-antagonist around the dorsal root ganglion in a lumbar radiculopathy model. Spine (Phila Pa 1976) 2018;43:E321-6.
2. Mizuno S, Takebayashi T, Kirita T, Tanimoto K, Tohse N, Yamashita T. The effects of the sympathetic nerves on lumbar radicular pain: A behavioural and immunohistochemical study. J Bone Joint Surg Br 2007;89:1666-72.