Diameter (mm)*	n	Mean Volume (mm^3)	Volume Range (mm^3)	Ratio Max/Min Volumes†
2	21	11.6	4–24	6
3	76	22.2	6–68	11.3
4	94	37.7	8–9	11.4
5	66	67.2	23–212	9.2
6	70	87.0	28–297	10.6
7	55	110.5	24–350	14

Volume ranges of 382 aneurysms with estimated largest diameters of 2–8 mm

* Estimated largest aneurysm diameter.
† Ratio of maximum/minimum true aneurysm volumes.

this article, some operators may be satisfied with unacceptable low packing densities in coiling of small aneurysms with inherent risks of rebleeding and reopening with time.

The calculation of aneurysm volume is difficult: Aneurysm shape is often irregular and measurements of dimensions on 2D images need to be adjusted for largely unknown magnifications. Volume measurements from 3D angiographic datasets are more accurate but still depend on manual aneurysm segmentation and image threshold settings. Recently we developed a method to overcome the problem of manual threshold setting by using gradient edge detection to define the contours of aneurysms and validated this method with phantoms.[4]

References

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2. Sluzewski M, van Rooij WJ, Slob MJ, et al. **The relation between aneurysm volume, packing, and compaction in 145 coiled cerebral aneurysms.** *Radiology* 2004;231:653–58
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Reply:

We read the letter of Drs. Willem Jan van Rooij and Menno Sluzewski criticizing our study.[1] We freely admitted within our article that using the formula $4/3\pi r^3$ overestimates the volume in some instances. However, the behavior of single coils on deployment within the small aneurysms has indicated that they were appropriately sized. This behavior has confirmed the use of vessel references in these circumstances because the single coil conformed to the confines of these small aneurysm sacs without excessive movement on deployment and detachment. As most interventionalists do, we tend to undersize the coil in ruptured aneurysms. That a single small coil in the neck of a 7-mm aneurysm resulted in obliteration, we consider fortunate.

There is significant variation in aneurysm volume in van Rooij and Sluzewski's table and in their other cited publications.[2-4] In their submitted table, the mean aneurysm volume was larger for the 2- to 5-mm aneurysms than ours using the volume of a sphere. They also had a significant range in their calculated mean volume, which used biplane angiography, rotational angiography, and a custom computer program. These were all larger than that measured with our technique. In addition, there was a significant range in each of their measured volumes. We did not have any 6-mm aneurysms, and the 2 7-mm aneurysms in our study had a calculated volume significantly larger than the mean volume of van Rooij and Sluzewski. However, this volume was still smaller than the upper range of the measured volumes of the 7-mm aneurysms in their table.

Their technique is quite sophisticated, requiring rotational angiography and a custom computer program, which are not available to all. The technique that we used for our study is simple, practical, and demonstrates excellent results in these small aneurysms. Our experience and that of others including van Rooij and Sluzewski is that the greater amount of coil deposited within an aneurysm, the less risk of coil compaction or aneurysm recurrence. However, we also believe that efforts to achieve some arbitrary packing attenuation in small aneurysms may lead to aggressive attempts at placing additional coils that may be dangerous. We wish to communicate that for many small aneurysms, a single coil may be curative.

References

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Subarachnoid Hemorrhage Due To Isolated Spinal Arteries: Rare Cases with Controversy About the Treatment Strategy

Recently, Massand et al[1] reported 4 more patients with ruptured isolated spinal artery aneurysms successfully treated by surgery. Subarachnoid hemorrhage (SAH) due to isolated spinal aneurysms without associated arteriovenous malformation (AVM) or other entities such as aortic coarctation or vasculitides is very rare. Only approximately 20 cases of spinal SAH due to rupture of isolated spinal aneurysms have been reported until now. The clinical hallmarks of spinal SAH are back pain and, later, cranial and meningeal symptoms. The angiographic appearance of the spinal aneurysms tends to be fusiform along the course of the artery.[1,2] An inflammatory process, dissecting aneurysms, and no evident cause are discussed as the underlying etiology.

Perhaps spinal artery aneurysms are more frequent than we believe and should, accordingly, be diagnosed more often by MR imaging and MR angiography in cases of spinal SAH. Recently, we detected our fourth patient within 3 years with isolated spinal aneurysm at the descending anterior spinal artery at level T12. At the time of admission, our patient had paraplegia and symptomatic cerebral vasospasms, which had already induced large bilateral hemispheric infarcts. Therefore, the prognosis was judged unfavorable. There were