The article by Murayama, et al., is an excellent and timely report. It is excellent because it contains a very careful analysis of the large number of patients treated using endovascular embolization with Guglielmi Detachable Coils (GDCs) at the institution where the technology was clinically developed. It is timely because its printing comes on the heels of the publication of early results from the International Subarachnoid Aneurysm Trial (ISAT).1 These are two very different studies, however. The ISAT is a randomized multinational study that addresses issues of safety and clinical results in the treatment of ruptured aneurysms believed to be equally amenable to endovascular coil placement or microsurgical clipping. So far, only the clinical results from the 1-year follow up have been reported. In contrast, the current study is a single-institution nonrandomized one that involved only those patients selected to undergo endovascular coil treatment for ruptured or unruptured aneurysms. The authors report on early morbidity rates following endovascular treatment with GDCs as well as midand long-term efficacy (rate of complete occlusion of the aneurysm and rate of rebleeding) of this treatment. In this latter respect, this article complements very nicely the interim report from the researchers of the ISAT, which addresses only the short-term (1-year) results thus far. Additionally, in contradistinction to the ISAT, the efficacy of endovascular coil placement was carefully analyzed in the current study in terms of rates of complete occlusion and recanalization of aneurysms of different sizes and morphologies.

The study involved 818 patients with 916 aneurysms. The authors divided the patients into two groups somewhat artificially, although they do explain their rationale for doing so (Food and Drug Administration [FDA] approval, the introduction of softer and more versatile coils, and the introduction of balloon-assisted technology). Group A included patients treated before 1996 and Group B, those treated since 1996. Overall, treatment-related morbidity and mortality was 9.4%. The most important findings of the study indicate that complete occlusion initially could be achieved in only 55% of the aneurysms in which it was attempted and that during follow up there was an overall recanalization rate (>10% increase in contrast filling of the aneurysm compared with its appearance on the immediate postembolization angiogram) of 20.9%, although the rate was much higher in small aneurysms with wide necks and in large and giant aneurysms. Another important finding of the study is that in Group A, which had at least 5 years of follow up, the rate of delayed rupture after initial treatment was 4.1%, an amount slightly less than a 1% annual rebleeding rate. This low rate of delayed bleeding is surprising in view of the fact that the rate of complete occlusion was low and nearly one half of the aneurysms were incompletely occluded. In other words, even though the rate of complete occlusion is low and the recanalization rate after embolization is relatively high, the rate of delayed bleeding is relatively low. It may be that, in very general terms, coil placement markedly reduces the rate of early rebleeding but does not completely eliminate the risk of late rebleeding in ruptured aneurysms and may not significantly change the natural history of unruptured aneurysms. Incidentally, the aneurysm rupture rate is lower in Group B, but because the follow up is much shorter in this group, it is difficult to compare these numbers.

One disturbing aspect of the paper is that in aneurysms generally considered to be ideal for surgical clipping, that is, small aneurysms with small necks, the rate of complete occlusion was only 75.4%. In other words, approximately one fourth of aneurysms that are generally ideal for surgical clipping could not be occluded completely with endovascular coil placement. Of course, as expected, the number of aneurysms that could be completely occluded falls rapidly as one looks at the more difficult-to-treat groups, that is, small aneurysms with wide necks (still a relatively fa-
neurological grade after an acute SAH. It appears unlikely, however, that similarly low morbidity and mortality rates can be achieved with the use of open microsurgical clipping in patients who have higher neurological grades after an acute SAH.

2) It appears that in the best hands, which can be assumed to be the case in the center at which this technology was developed, a complete initial occlusion with GDCs could be achieved in only slightly more than half of the patients (55%) in this series. This number is higher with regard to small aneurysms with small necks, but still only three fourths of such aneurysms, which from an anatomical point of view are ideal for surgery, can be occluded with coils. Note, however, that in ruptured aneurysms, an incompletely occluded one is not synonymous with an “unprotected” one; that is, the early rate of rebleeding of these incompletely coiled aneurysms is relatively low and certainly much lower than the rate of rebleeding expected of a completely unprotected ruptured aneurysm. The delayed bleeding rate after coil delivery (>6 months after initial hemorrhage) may approximate 1% per year, a rate comparable to the bleeding rate of an unprotected ruptured aneurysm and only slightly lower than the rebleeding rate of a ruptured aneurysm that has healed.2

3) Although the authors of this paper suggest that the rate of incomplete occlusion and that of recanalization are relatively high, they do not provide a direct comparison of these results with those from surgery. Therefore, long-term reports of such direct comparisons, as promised by investigators in the ongoing ISAT, will be essential in determining the early safety and the long-term effectiveness of one form of treatment compared with another, at least in ruptured aneurysms in the case of the ISAT. Unfortunately, researchers from the ISAT, because of the lack of a consistent angiographic follow-up, will offer no information about anatomical results in terms of degree of occlusion, rate of recanalization, and so forth. Therein lies the importance of this paper.

4) Endovascular coil treatment of aneurysms is an elegant and welcome addition to our therapeutic armamentarium. Neurosurgeons will do well to learn these techniques, which, I have no doubt, will become safer and more effective in the future. We are fortunate to have a small cadre of visionary neurosurgeons and a larger group of endovascular neuroradiologists who, like Vinuela and colleagues, are willing to teach these techniques to our young neurosurgical colleagues in much the same way that some of us taught our neuroradiology colleagues to perform some of the invasive diagnostic techniques that were previously in the exclusive domain of clinical neurologists and neurosurgeons. I heartily congratulate the authors for offering us a thoughtful, clear, honest, and detailed report of their experience with this wonderful technology that they have introduced into clinical practice for the benefit of our patients.

References