Frontiers of stent-assisted aneurysm coiling

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Endovascular treatment (EVT) by selective coiling is nowadays considered as the first-intention treatment of intracranial aneurysms (IA); however, EVT presents two major limitations: (1) treatment of wide-necked aneurysms and (2) recanalization. In order to circumvent these limitations, many new devices have been developed over the last decade (bioactive coils, liquid embolic agent, supporting devices, etc.). Among them, intracranial stenting with dedicated self-expandable stents is clearly the most promising one.

Many authors have evaluated stent-assisted coiling showing that this technique was effective and safe for EVT of complex IA, including wide-necked and fusiform lesions [1–5]; however, it has also been shown that the use of the associated mandatory anticoagulation/antiplatelet medication may increase the complication rate when compared to conventional coiling [6]. This potentially higher complication rate is mostly seen in patients with ruptured IA. Therefore, most authors agree that stent-assisted coiling may be proposed for patients with unruptured IA, whereas it must be strictly limited to otherwise untreatable ruptured IA [1–7]. Stenting has thus brought a satisfying answer to one of EVT's limitations by enlarging its indications.

On the other hand, the adjunctive effect of stenting on IA occlusion has been suggested for years in experimental and early clinical studies [1–5, 7–11]. Indeed, stents should be considered as mechanical, hemodynamical, and biological active devices that may help prevent aneurysm recanaliza-

tion and contribute to vessel wall healing. Few authors have recently reported the positive effect of stenting over the stability of aneurysm occlusion [6, 12, 13]; however, we must admit that only large randomized studies will allow us to draw final conclusions. Last but not least, in large series with midterm follow-up, the percentage of in-stent stenosis is low, around 5%, in the vast majority without clinical symptoms [1–6, 12–14]. Stenting will thus probably bring an answer to EVT's second limitation by stabilizing its anatomical results.

For all these reasons, it appears obvious that the use of stents will continue to expand EVT indications. Recently, new “audacious” techniques using stents have been reported: X- and Y-stenting, the waffle-cone technique that consists of placing the distal end of a stent directly into the base of a bifurcation aneurysm and coiling through the expanded and cone-shaped distal stent end [15–18].

All authors agree that these “audacious” stent-assisted techniques should ideally be restricted to otherwise untreatable IA. Indeed, X- and Y-stenting require the use of multiple stents within very small vessels and one can seriously fear for long-term tolerance. Concerning the waffle-cone technique, the recurrence rate seems very high because the arterial flow is “focused” via the stent on the aneurysm base. That is the reason why authors recommend performing an early control to exclude any quick major recanalization. In daily practice, these techniques—and mostly the waffle-cone technique with its “disappointing” anatomical results—could easily be proposed as first-intention treatment for posterior circulation aneurysms whereas clipping might remain the first choice in the anterior circulation until long-term results are known. On the other hand, the permanent release of new, better, safer, etc. devices might make us sometimes forget this wise and cautious approach.

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We clearly see that frontiers of stent-assisted aneurysm coiling are not related to the technique itself. Thanks to the new available devices, all IA are theoretically treatable by endovascular approach. These frontiers are simply related to the definition of “otherwise untreatable” IA that may vary a lot among physicians and neurovascular teams. It highlights, once again, the need for a multidisciplinary neurointerventional–neurosurgical approach that aims to offer the best treatment (lower complication rate, stable anatomical results) to our patients. To be provocative, I would say that the ideal equilibrium is perhaps reached when the neurointerventionalists are suggesting clipping while vascular neurosurgeons are asking us to stent.

Conflict of interest statement I declare that I have no conflict of interest.

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