LETTERS TO THE EDITOR

Regarding "Multiple overlapping uncovered stents as an alternative flow-diverting strategy in the management of peripheral and visceral aneurysms"

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We read with great interest the paper by Zang et al[1] recently published in the *Journal of Vascular Surgery* on the use of multiple overlapping uncovered stents as an alternative flow-diverting strategy in the management of peripheral and visceral aneurysms.

Flow-modulator multilayer stents (FMSs) have attracted great interest in the recent years, their utility in treating arterial aneurysms being a highly debated topic.[2] FMSs have been successfully used in a number of different conditions, from visceral and peripheral artery disease to treatment of thoracoabdominal aortic aneurysms, when standard endovascular therapy was considered unfeasible.[3,4]

Zhang et al[1] report a new technique that achieves flow modulation by overlapping multiple uncovered metal stents, which overcomes the technical problems related to the quite unpredictable stent shortening that affects the only commercially available FMS. Moreover, with their technique, Zhang et al[1] are able, by adding a different number of stents, to tailor the therapy case by case. According to the study, exceptional results may be achieved with this new technique: 100% technical success, no complications, and no deaths at 24 months.

Would this be the situation, this new strategy would represent the definitive solution for such a complex situation. However, is flow modulation really so good? At present, there are conflicting data in literature on the topic. FMSs do not immediately exclude the aneurysmal sac from blood flow, and internal pressure has been reported to return to pretreatment level within a short time after FMS deployment.[5] Thus, the patient is not immediately protected by aneurysmal rupture with this technique, and lethal aneurysm rupture after FMS implantation may occur.[6]

Zhang et al[1] report clinical success, defined as "complete aneurysm thrombosis, aneurysm shrinkage or stabilization," in 35 of 37 (94.6%) of their patients. Thus, two of 37 (5.4%) of their patients are supposed to have a still perfused and enlarging aneurysm at 24 months after treatment. No details about management of those patients are provided.

Open questions remain about the rupture risk of such patients who underwent treatment with FMS but have still perfused and enlarging aneurysms. What is the risk of aneurysm rupture in these patients? When does the treatment with FMS have to be considered as failed and further therapeutic strategies have to be taken into consideration?

Moreover, several factors, such as aneurysm morphology, number and origin of side branches, and the presence of mural thrombus, have been reported as potentially influencing the final aneurysm thrombosis, and factors affecting the patency of collateral vessels have not been fully investigated yet[2,4]

In conclusion, even if flow diversion with FMSs or multiple overlapping uncovered stents represent an appealing novel treatment for arterial aneurysms, evidence of efficacy of these strategies is still limited, and further investigations are needed before their application in every day clinical practice.

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Reply

As a new alternative in the endovascular management of complicated peripheral and visceral artery aneurysms where side branches need to be maintained, the flow-diverting stent has attracted great attention since its first clinical application in 2008.[1] Despite its increasing clinical application, there remain several controversies regarding its safety and efficacy in the literature.[2,3]

In our study, we reported an alternative flow-diverting strategy using multiple overlapping uncovered stents (MOUS) in the treatment of peripheral and visceral artery aneurysms, with an overall clinical success rate of 94.6% (35 of 37).[4] In the remaining two patients, persistent aneurysm sac residual perfusion over 2 years was noticed, which was considered as a clinical failure by definition. However, neither patient presented with an enlarging aneurysm sac during follow-up, and significant mural thrombus deposition was noted in both aneurysms (Fig, *A* and *B*). No further treatment, therefore, was performed, except strict blood pressure control and regular follow-up. Although there is no consensus about the timing when other treatment options, such as open repair, need be considered in such a situation, at present, we believe that further intervention would be necessary if aneurysm expansion was observed during follow-up.

A flow-diverting stent might not be able to decrease the sac pressure like a stent graft. In another study, we