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Taylor made 3D vascular model for the endovascular treatment of cerebral aneurysms

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Purpose:
The introduction of high-performance 3D printers has made it possible to create accurate tailor-made hollow 3D vessel models from preoperative imaging data of each patient. We use these models under fluoroscopic guidance for preoperative simulation and training or testing of new devices.

Methods:
The 3D-DSA data were used to create computer-aided design (CAD) files. Ziostation2 software (Ziosoft Inc.) is used to create CAD files of hollow intracranial vessels and aneurysm models. The data were converted into an STL file and output to a 3D printer. Finally, a silicone-resin anatomically accurate aneurysm model was created using a 3D printer.
We inserted various devices into the model under the same conditions as at the time of treatment for the preoperative simulation,
We also used the model as training for the introduction of new devices.

Results:
The operability of the device in the model was similar to that in actual clinical practice, and the physicians were highly satisfied. The device was very useful in terms of movement of the coil within the aneurysm, stent deployment at vessel bends, and observation of stent aposition. In addition, when introducing a new device, the W-EB, it was useful in terms of size selection as well as observation of the deployment.
The greatest advantage of this model is that it is tailor-made and accurately reproduces the patient's aneurysm and surrounding vessel, allowing detailed case-by-case testing and realistic operation with actual device insertion. On the other hand, one issue is the cost of the devices used for testing, and at present it is not realistic to simulate the final stages of the treatment, when many coils are used.

Conclusions:
As the near future of endovascular treatment of cerebral aneurysms, our model has excellent reproducibility of aneurysm and surrounding vessel and actual use of the device.
If cost issues can be overcome, it can be developed into a full-scale tailor-made treatment.