Rabbit Subselective Angiography Stroke Model

To the Editor:

We congratulate Jahan et al1 on their description of a subselective angiographic rabbit stroke model using microcatheters. Their feasibility study is a good step toward a badly needed improved model of acute stroke, as we suggested in our previous work.2 We are eager to hear more of the many details that are necessary to put this model into routine use.

Based on our own angiographic experience in >300 rabbits, several questions must be answered relating to the mechanics of the technique and the applicability as a model of human stroke. The primary goal of this model is to mimic the human situation of ischemic stroke, usually an embolic event in fairly normal vessels, and create a reproducible stroke to compare interventions.

We agree that delivery of thrombin to cause fresh thrombosis of the terminal vessel may not be a good model of an individual human embolic clot causing stroke. The human embolus typically occludes a segment of vessel and may allow collaterals to preserve some flow distal to the obstruction. The extent of the thrombin clot in the rabbit model is unknown and may fill the entire vessel including some collaterals. The proportion of the all-important penumbra may therefore be reduced in this model. The ideal model would involve formed clot delivered to the proximal middle cerebral artery (MCA), a daunting task considering the tiny inner diameter of the 1.2F catheter.

Although angiographic success was shown, the reproducible volume of stroke needs to be fully delineated. Histological studies of the entire brain volume are required for this because of the long course of the MCA. A few histological sections are not adequate. The authors report taking histology at 2 hours, when the histological changes will still be evolving and may be poorly defined. A longer survival is necessary for clear results, and we routinely take specimens at 12 to 24 hours, along with using additional staining techniques. Triphenyltetrazolium (TTC) is more sensitive than H&E for stroke detection. Anatomic variations in the MCA also enter the picture because 29% of MCA are duplicated in rabbits and selection of only one of these will decrease the expected stroke volume.3

We have also found that arterial spasm is fairly common when working at the Circle of Willis, even with these tiny microcatheters. Spasm alone can cause strokes here, a confounding event if trying to produce a standard size stroke. This can severely limit the potential benefit gained from subselective catheterization.

What was the author’s experience? We have also seen premature deaths at 2 to 4 hours after completely occluding the MCA with an embolus. Is that the reason such a short survival time was reported?

The cost of a microcatheter and special guidewire is especially high, adding over $600 to the procedure. Although we have been able to use one set on up to 3 rabbits, they are very fragile, and usually we are lucky to get 2 completed before compromising the catheter or wire. We have found that an inexpensive 3F catheter can be used to select the internal carotid many times before disposal is required. However, it cannot progress through the internal carotid to the MCA.

We are most anxious to see subsequent reports from this group on the further development and refinement of the technique. A replacement for the failed mouse model is urgently needed.4 This shows great promise.

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