

Transvenous AVM Embolization: is it a solution for AVM treatment?

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Disclosures:

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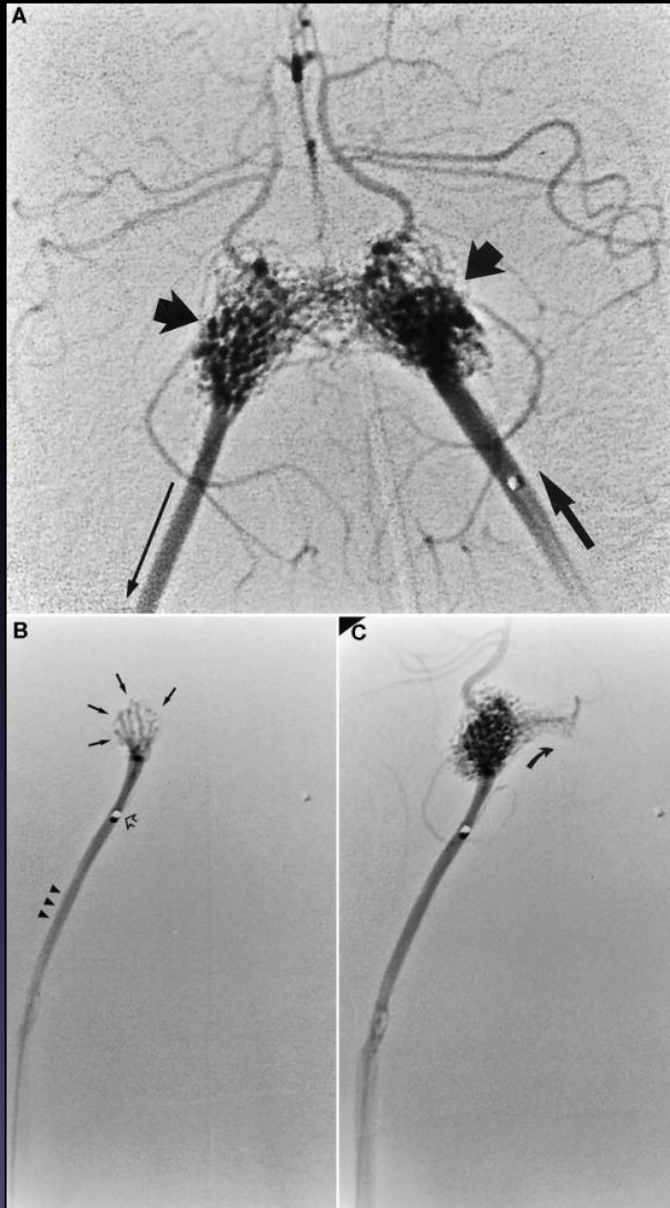
Pipeline Proctor: Medtronic



Background

- Tarik Massound and George Hademenos
 - TRENSH technique
 - Model in swine: hypotension/arterial balloon with transvenous retrograde infusion into AVM
 - Neurosurgery 1999;45:351-63





Transvenous Retrograde Nidus Sclerotherapy under Controlled Hypotension (TRENH): A Newly Proposed Treatment for Brain Arteriovenous Malformations- Concepts and Rationale.

Massoud, Tarik; Hademenos, George

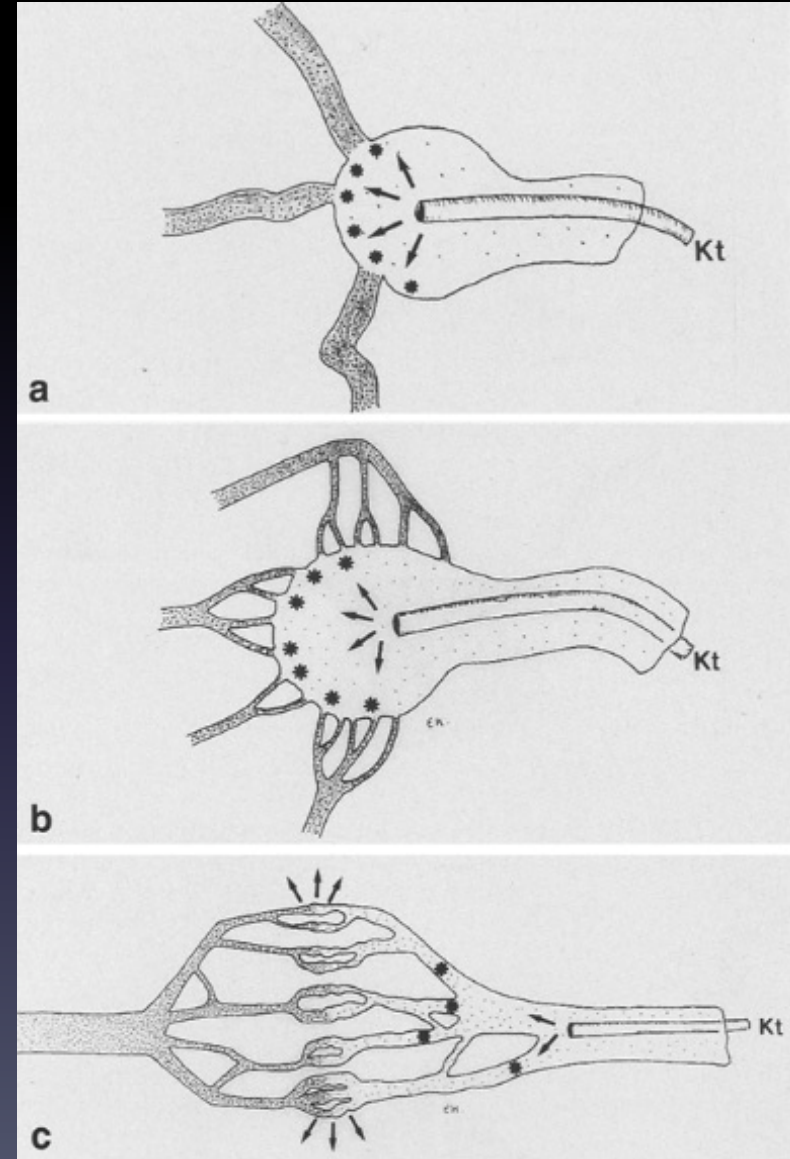
Neurosurgery. 45(2):351, August 1999.

FIGURE 3. A, supraselective angiogram through the left ascending pharyngeal artery (the main feeder) (long thick arrow) to show components of the swine AVM model, as described previously (38). The nidus is formed by bilateral retia mirabilia (short thick arrows) joined in the midline by inter-retial connections. Blood is shunted rapidly from the left rete to the right rete and retrogradely down the right ascending pharyngeal artery (the main draining vein) (long thin arrow) to a large right-sided carotid-jugular fistula in the neck. B, at systemic normotension and arterial feeder normotension (mean pressure, 64 mm Hg), a transvenous retrograde injection of contrast medium shows minimal penetration of the nidus in the face of strong antegrade flow through the AVM. Open arrow, tip of transvenous catheter; multiple small arrows, retrograde spread of contrast up the nidus; arrowheads, antegrade flow of contrast medium around the catheter toward the neck fistula. The tip of the arterial feeder microcatheter is also seen. Appearances are comparable to those that might be seen in a brain AVM undergoing an attempted TRENH at arterial normotension (Fig. 2D). C, there is significantly greater retrograde permeation of the nidus (curved arrow) when a similar retrograde angiogram is performed through the same draining vein at systemic hypotension, resulting in a lower feeder mean pressure of 45 mm Hg. Appearances are comparable to those that might be seen in a brain AVM undergoing an attempted TRENH at a moderate level of systemic/feeder arterial hypotension (Fig. 2F). The lower the systemic and feeder pressure, the greater the retrograde filling of the nidus using similar injections. In this AVM, near-total retrograde permeation of the nidus was observed at a mean feeder pressure of 27 mm Hg.

Background

- Houdart Classification
 - A. AVF
 - B. arteriovenous fistula
 - C. arteriovenulous fistula

Houdart, *Neuroradiology* 1993;35:381-5.



AVM treatment/embolization

ARZUBA

Learning from ARUBA Trial:

The most important learning point from the highly controversial trial.

Annual Hemorrhage Risk:
2.2%/yr

10.6%/5yrs

19.9%/10yrs

35.9%/20yrs

48.7%/30yrs ...



Issues with Transvenous Embolization of AVMs

- Can you assure arterial input occlusion before venous occlusion?
- All or none approach, similar to surgery, no staging.
- Arteriovenulous type with multiple feeders and compartments?
- Deep penetration of catheter into vein? With retrograde filling can you see better?
- How long can you inject? Is it a race between occlusion and bleeding?
- When do you stop?



Issues with Transvenous Embolization of AVMs

- Can you assure arterial input occlusion before venous occlusion?
 - Some method to control arterial input
 - Balloons, hypotension, embolization of artery
- All or none approach, similar to surgery, no staging.
 - Typically smaller AVMs with few feeders and single venous outlet
- Arteriovenous type with multiple feeders and compartments?
 - Arteriovenous type preferable (single venous outlet)
- Deep penetration of catheter into vein? With retrograde filling can you see better?
 - Relatively simple venous route (risk for perforation?)
- How long can you inject? Is it a race between occlusion and bleeding?
 - Inject a little quicker than for arterial injection (variable in reported cases).
- When do you stop?
 - Balloon in artery may assist in preventing retrograde arterial filling.



Issues with Transvenous Embolization of AVMs

- Do you put the venous outlet at risk?
- Distal embolization of agent?
- Inability to get plug?
- Rapid reduction in venous flow leading to venous thrombosis including normal venous outlet?
- Retraction injury to vein during catheter pull?



Issues with Transvenous Embolization of AVMs

- Do you put the venous outlet at risk?
- Distal embolization of agent?
 - Arterial control to reduce flow
 - Second catheter (coils)
- Inability to get plug?
 - As above
- Rapid reduction in venous flow leading to venous thrombosis including normal venous outlet?
 - Smaller AVM with less flow
 - Long venous outlet before normal venous connection
 - Anticoagulation may be problematic
- Retraction injury to vein during catheter pull?
 - Detachable tip
 - Support catheter
 - Implant microcatheter



Transvenous AVM Embolization: is it a solution for AVM treatment?

- So, is this a good approach?
 - Warrants further investigation
 - Probably some applicability
 - Small AVMs with small feeders not amenable to arterial access, simple venous outlet anatomy, non-surgical/radiosurgical candidates, ability to control input via balloon or hypotension, able to be managed post procedure with extended sedation/hypotension



Transvenous AVM Embolization: is it a solution for AVM treatment?

- Ultimately, not a solution, but an perhaps an option in highly selected cases
- What is the most important part to think about for an embolization or a romance?
- Anybody can get into one, but how you get OUT is the trick!

