# What Thoracic and Abdominal Aneurysms Are Treated by Open Surgery: Will Sac Filling by In Situ Silicone Polymerization Change This?

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**Purpose**
Endovascular repair of aortic aneurysms is progressively accepted as an alternative to open surgical repair because of reduced mortality and morbidity. Disadvantages, however, include stent graft migration, endoleaks and substantial reintervention rates. The purpose of this study was to develop a percutaneous technique, applying a new concept of aneurysm sac filling by means of in situ polymerization.

**Methods**
The principle of the technique is based on exclusion of the aneurysm by means of a specifically designed balloon. A 7F catheter positioned in the aneurysm sac was used to deliver the components which polymerized in the aneurysm sac. The requirements for the material included nontoxic properties and isothermical polymerization without release of toxic by-products. Polymerization time should be sufficiently long to complete the injection process. When polymerized, the strength and durability had to be sufficient to withstand the stresses and forces in the aorta.

**Results**
Polydimethylsiloxane (PDMS) was used as the basic silicone monomer. By vinyl termination the molecular weight can be varied with subsequent different viscosities. Silica was added as a filler in order to increase the mechanical properties of the polymerized end product and Vinyl Q was incorporated in the polymer matrix to increase resistance to tear. The material tested had a yield-stress of approximately 400 kPa, failing at 20% elongation. A latex aneurysm model was developed to test the injection technique and exclusion of the aneurysm. Angiographic pumps injected the two components through a 7F catheter, filling up the entire aneurysm sac. Computed tomography of the silicone-filled model showed complete obliteration of the aneurysm and a normal-sized “neo”-aorta after removal of the balloon.

**Conclusions**
In vitro experiments show that the principle of aneurysm sac filling by means of in situ polymerization is feasible, excluding the aneurysm and creating a new lumen. In-vivo experiments have to be performed prior to clinical application.