Materials used in embolization include coils, ethanol, sodium tetradecyl sulfate, cyanoacrylate, polyvinyl alcohol (PVA), microspheres, and gelatin sponge (Gelfoam), among others.

Liquid embolic agent

Liquid embolic agents.

Ethiodol.

Ethanol. - This permanent agent is very good for treating AVM. The alcohol does need some time to denature proteins of the endothelium and activate the coagulation system to cause a blood clot. Therefore, some surgeons will use a balloon occlusion catheter to stop the blood flow and allow time for ethanol to work. Ethanol is toxic to the system in large quantities and may cause compartment syndrome. In addition, the injections are painful.

ethanolamine oleate - This permanent agent is used for sclerosing esophageal varices. It contains 2% benzyl alcohol, so it is less painful than ethanol. However, it does cause hemolysis and kidney failure in large doses.

sotradecol - This agent is used for superficial lower extremity varicose veins. It has been around for a very long time and is a proven remedy. However, it does cause hyperpigmentation of the region in 30% of patients. It is less painful than ethanol.

Particulate embolic agents

These are only used for precapillary arterioles or small arteries. These are also very good for AVM deep within the body. The disadvantage is that they are not easily targeted in the vessel. None of these are radioopaque, so they are difficult to view with radiologic imaging unless they are soaked in contrast prior to injection.

Gelfoam hemostasis - Temporarily occludes vessels for five weeks. Works by absorbing liquid and plugging the vessel. Composed of water-insoluble gelatin, the particles may travel distally and occlude smaller capillaries. One way to localize the injection of gelfoam is to make a gelfoam sandwich. A coil is placed at a precise location, then gelfoam is injected and lodged into the coil. polyvinyl alcohol (PVA) - These are permanent agents. They are tiny balls 50-1200 um in size. The particles are not meant to mechanically occlude a vessel. Instead they cause an inflammatory reaction. Unfortunately, they have a tendency to clump together since the balls are not perfectly round. The clump can separate a few days later, failing as an embolic agent. Embolization microspheres - These are superior permanent or resorbable particulate embolic agents available in different well-calibrated size ranges for precise occlusion.

Embolization microspheres may comprise additional functionality such as drug loading and elution capability, specific mechanical properties, imageability, or radioactivity Mechanical occlusion devices - These fit in all vessels. They also have the advantage of the accuracy of location; they are deployed

exactly where the catheter ends.

coils - These are used for AVF, aneurysms, or trauma. They are very good for fast-flowing vessels because they immediately clot the vessel. They are made from platinum or stainless steel. They induce clots due to the Dacron wool tails around the wire. The coil itself will not cause mechanical occlusion. Since it is made of metal, it is easily seen in radiographic images. The disadvantage is that large coils can disrupt the radiographic image. The coil may also lose its shape if the catheter is kinked. Also, there is a small risk of dislodging from the deployed location.

detachable balloon - Treats AVF and aneurysms. These balloons are simply implanted in a target vessel, then filled with saline through a one-way valve. The blood stops and endothelium grows around the balloon until the vessel fibroses. The balloon may be hypertonic relative to blood and hence rupture and fail, or it may be hypotonic and shrink, migrating to a new location.