

Trends in Embolization Technologies and Applications

Jafar Golzarian, MD, encapsulates the current state of embolization agents and a glimpse of what's to come.



To start, how would you classify the current range of options in the embolization field?

They are most commonly classified as particles, coils, plugs, and liquid embolic options; however, there may be different classifications for each of these embolic materials.

How has the field evolved during the past 5 years or so? What would you say are the most noteworthy trends?

The particles have evolved from the original polyvinyl alcohol to spherical particles in the past decade. In the last 5 years, the spherical particles have been more widely used. Embozene microspheres (CeloNova BioSciences, Inc., San Antonio, TX) recently received US Food and Drug Administration approval for the indication of uterine fibroid embolization. More spheres have been used as a platform to load drugs and radioactive materials. Besides the well-known DC Bead (Terumo Europe/Biocompatibles, Leuven, Belgium), LC Bead (BTG International, West Conshohocken, PA), and HepaSphere/QuadraSphere microspheres (Merit Medical Systems, Inc., South Jordan, UT), the Embozene Tandem drug-elutable microspheres (CeloNova BioSciences, Inc.) have been used more recently in Europe and across the world. The trend in this field is toward resorbable and loadable particles. Some new resorbable particles are under development and will soon be submitted for US Food and Drug Administration approval.

New coils, both pushable and detachable, have also recently been developed. The use of detachable coils

with different lengths and volumes is on the rise, and a new coil without a metallic frame has also arrived to the market this year.

Also, new microvascular plugs have been developed that present new horizons in the field of vascular embolization, as they can be used in microcatheters as small as 0.021 inch with great ease.

Finally, the use of liquid embolic materials is increasing in peripheral applications. New materials are in the pipeline and will hopefully be available next year.

What message do you take from the current level of commitment from industry, and how has this changed?

In the last 5 years, the indications and market share of embolization have significantly increased. The biggest growth has been in the field of particulate embolization. There are some indications that embolization will be the area that provides the most growth in the peripheral vascular intervention arena in the next decade.

The level of commitment from industry is great and has significantly increased. A few companies that have never had any embolization materials have now decided to get involved in this field. Other major companies have restructured and are focusing on embolization by creating an embolization division and are investing in the research and development of this space. The neurointerventional industry has also moved toward focusing on the peripheral embolization market. Finally, many new start-ups have developed that will bring a wealth of great materials to the peripheral embolization arena soon.

As the embolization armamentarium continues to expand and improve, how do you decide which option to use in each setting?

This is a very important question that is actually in and of itself an art, and there are textbooks and meetings focusing on this very aspect. The choice depends on the level of occlusion, desired endpoint, type of disease and organ being treated, as well as the type of catheters and microcatheters used. Cost, radiation exposure, and ease of use are some of the other important factors to consider.

What specific clinical utilities are added by new coil technologies (detachable, pushable, etc)?

Coils have been used for many different indications. The new technologies have allowed usage in more challenging cases, such as high-flow situations and fistulas. Also, the new coils allow more distal, much faster, and better packing of the vessels and aneurysms.

Aside from the improved capabilities of embolic devices and the materials themselves, how critical is the development of delivery technologies such as microcatheters? How have these progressed, and what else would you like to see from the next generation?

This is essential to the development of the field. The high-flow microcatheter technology (0.027 and 0.028 inch) has significantly improved in the past decade. There are many new microcatheters with different technologies available and in the pipeline. The usage of smaller-size microcatheters is on the rise in peripheral interventions, especially for the liver, gastrointestinal bleeds, and prostate embolization. I would like to see more dedicated peripheral microcatheters in sizes such as 0.02 inch in the United States.

What are the most intriguing new clinical applications?

In my opinion, the most intriguing new applications are prostatic artery embolization for benign prostatic hyperplasia and gastric artery embolization for weight loss. Although prostatic artery embolization is gaining general acceptance, with more than 800 cases performed worldwide, gastric artery embolization is just getting started. These techniques are both still in their infancy.

How would you describe the current cost-effectiveness and reimbursement pictures?

Reimbursement is not yet at an optimal level. I think with providing more evidence on both the outcomes

and the cost-effectiveness, the reimbursement could increase significantly. We have not yet shown much level one evidence that this technique is both better and less expensive than alternative techniques (surgery or medication). In terms of cost-effectiveness, although some of the materials are expensive at first glance, the cost to society compared to other alternative therapies seems to be lower, as they may reduce the length of hospitalization and allow an earlier return to work.

What is one currently unmet need that you hope will be addressed in a future iterative advancement?

There are several unmet needs, but to mention one, I would say there is a need for resorbable particles with controlled resorption and controlled drug release. This can help in general indications where particles are used, but can also extend to the application of embolization in the field of cancer therapy. ■

Jafar Golzarian, MD, is Professor of Radiology with the Department of Interventional Radiology, University of Minnesota Medical Center, in Minneapolis, Minnesota. He has consulting agreements with companies who manufacture coils and particles, but no disclosures directly related to this discussion. Dr. Golzarian may be reached at golzarian@umn.edu.