

Catheter-based intravascular ultrasound (IVUS) has become a common tool in today's catheterization laboratory. Imaging is increasingly being used to assist in device selection and endpoint assessment, such as guiding the cutting protocol in directional coronary atherectomy, appropriately sizing the rotational atherectomy burr, optimizing stent deployment, and quantitating luminal geometry following balloon angioplasty.

One of the most significant contributions made by ultrasound imaging has been to modify and redefine the concept of restenosis. Recent work suggests that a significant contribution to late lumen narrowing following intervention is overall vessel contracture or “reverse” remodeling. In other words, intimal hyperplasia is *not* the sole culprit responsible for restenosis. Additionally, intravascular ultrasound studies have provided strong evidence that plaque burden or residual plaque stenosis may play a critical role in determining which lesions are likely to develop restenosis. The GUIDE trial showed a strong correlation between residual plaque burden and both angiographic and clinical restenosis for patients undergoing either balloon angioplasty and/or directional coronary atherectomy. Testing this finding in related trials, aggressive DCA with ultrasound guidance (OARS, ABACAS) has shown that a reduction in plaque residual directly impacts favorably on lowering the restenosis rate without increasing acute complication rates.

The most widely used application of IVUS is to optimize stent deployment. Early on, despite adequate deployment by angiography, ultrasound demonstrated incomplete expansion in the majority of stented segments. This finding led to the adoption of high-pressure expansion techniques, which markedly improved subacute closure rates, despite a reduction in anticoagulation protocols. Several ongoing trials are designed to determine if the ultrasound findings of incomplete expansion, incomplete apposition, and/or the presence of edge tears in the high-pressure deployment era impact on the short and long-term outcome of patients undergoing coronary stenting. Recently the CRUISE trial showed that IVUS guidance of stent implantation results in a 44% reduction in target vessel revascularization compared to angiographic guidance alone.

In general, intravascular ultrasound has modified our concept of restenosis, provided detail about plaque/vessel morphology for directing device selection and optimization, and is becoming a standard tool for endpoint assessment in today's interventional cath lab.

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Educational Objectives:

1. To review the use of catheter-based intravascular ultrasound as a standard tool for assessment in today's interventional catheterization laboratory.
2. To discuss how intravascular ultrasound has made significant contributions toward modifying and redefining the concept of restenosis.

3. To describe how intravascular ultrasound is widely used to optimize stent deployment.