Mechanisms o f Brachytherapy

Gary S. Mintz, MD

Cardiovascular Research Foundation

New York, NY

Methodology is important to understanding mechanisms of brachytherapy, especially edge effects. Small patient-number IVUS substudies have the power to show significant in-lesion or in-stent treatment efficacy. However, larger numbers of patients are required to assess edge effects. It is important to look at individual cases, not only mean changes in EEM, lumen, P&M, and IH volume or CSA.

Mechanisms of brachytherapy in PTCA, stenting, and treatment of ISR are dose related: and include (1) decreased neointimal hyperplasia, (2) positive remodeling in PTCA-treated lesions, and (3) either no effect or positive remodeling along irradiated edges and uninjured reference segments. At the edges, where the dose is less and especially in the presence of geographical miss, there is a combination of increased neointimal hyperplasia and either absence of positive remodeling or frank negative remodeling that contribute to lumen loss.

The findings in -emitting stents are idiosyncratic and very different. There is a dose-related decrease in intra-stent neointima. The “candy wrapper” effect is primarily a focal exaggeration of IH accumulation at the edge of the stent. The late catch-up in neointimal proliferation needs to be studied in other settings.

Unusual IVUS observations such as unhealed dissections, late malapposition (also a manifestation of radiation-induced positive remodeling), and the “black hole” are worrisome; but their exact clinical consequence is unknown.