

## **Clinical Applications of Brachytherapy**

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Restenosis remains a significant problem after coronary interventions despite the wide spread use of stents. The in-stent restenosis rate varies from a very acceptable 10% to 50% for small, diffuse lesions in diabetic patients. Treatment using repeat balloon angioplasty, cutting balloon angioplasty, rotational atherectomy, repeat stenting did not significantly change the subsequent clinical course. For focal in-stent restenosis, the re-restenosis rate is 10 to 20%, however if the lesion is diffuse or totally occluded, the re-restenosis rate is upward of 80%.

Brachytherapy or intravascular radiotherapy has now emerged as the best method for the treatment of in-stent restenosis. The SCRIPPS trial with a small number of patients has demonstrated unequivocally that after 3 years, the restenosis rate continues to be favorably reduced. This observation has been reproduced in multicenter trials such as GAMMA I. However, from these early trials, it becomes clear that two significant side effects can result from brachytherapy. Late thrombosis can occur in 6 to 9% especially if a new stent was placed concurrently with the brachytherapy treatment. Also edge stenosis was found to occur at the border of injury and radiation. With the addition of prolonged platelet therapy and avoidance of new stents, the late thrombosis rate has been reduced to placebo rates. The careful coverage of the injured segment with adequate dose of radiation also has reduced the edge effect to a minimum. The more recent trials such as INHIBIT and START have confirmed that these added precautions can reduce these complications to a level no different to placebo rates.

The source of the radiotherapy can be gamma or beta radiation in origin. Both sources have been demonstrated to be effective. However, the need for extra shielding made the gamma source more difficult to apply clinically. Currently there are multiple beta systems available and each has its advantages and disadvantages.

The applications of brachytherapy will likely be applied to other subsets of patients in the future include other patients with restenosis, high risk de novo patients. Ongoing studies are going to resolve these issues in the near future.