Title: Intravascular Brachytherapy and its Role in the Management of the Cardiac Patient Jeffrey W. Moses, M.D.

Coronary artery disease is still the major cause of death in the industrialized world. Its principal manifestations are sudden death, heart attack and angina pectoris. Over the past 20 years coronary angioplasty (PTCA), non-surgical opening of arteries with balloons under x-ray guidance, has emerged as a principal treatment to relieve anginal symptoms and treat heart attacks. An estimated 600,000 PTCAs procedures will be performed in the US in 1999. A principle limitation of this procedure is an early (<6 months) recurrence rate of 30-45%. These recurrences are termed restenosis. Since the mid 1990s the placement of an endovascular prosthesis (coronary stent) has been popularized in an attempt to reduce restenosis. This has been partially effective, and has reduced recurrence rates by about 30-40%. This still leaves a restenosis rate of about 20%, with clinical recurrence occurring at 15% by 6-9 months.

Restenosis in stents can be a vexing problem. The cause of this recurrence is the buildup of scar tissue within the stent. If the segment of buildup is short (<10mm) it can be easily and effectively treated with another balloon procedure. If it is longer then this ("diffuse") the recurrence rate after balloons can be as high as 60-80%. Some patients must be referred to coronary bypass to resolve their symptoms, while others are not suitable for bypass and remain disabled. It is estimated that about one-half of the stent restenosis fall into this high risk group, about 40,000 patients.

Over the history of angioplasty there have been scores of trials of mechanical and pharmacological strategies to reduce restenosis. Up until now, no drug or mechanical treatment besides stents has been successful in reducing recurrences. While there are a few promising new agents in clinical trials, there is no clinically available drug for this problem.

The emergence of vascular brachytherapy as a potential treatment has excited the cardiologic community. The prospect of the ability to reduce recurrences in these difficult patients by up to 80% has inspired many centers to participate in clinical trials of vascular brachytherapy. Some have focused on primary prevention (at the time of initial PTCA), but most on their treatment of restenosis after stent implantation.

Such a program requires tight co-ordination between the interventional cardiologist, radiation oncologist, radiation physicist and safety officer. Similar to intraoperative therapy the radiation team cannot apply its therapy until the initial operative procedure is complete. A diffuse restenosis in a stent can be a protracted procedure requiring the ablation of tissue and the placement of more stents. The cardiologist's job is to restore an adequate lumen to the vessel to supply symptom relief. Once, this is achieved (taking about 30'-120') the cardiologist places the treatment system in the appropriate location in the coronary. Some anatomic subsets can make this a challenge. Usually, however, source placement is predictable and quick. It is at that time the physicist and oncologist enter the room.

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Treatments with current systems range from 3 to 25 minutes. However, prep time, QA and lab surveys add considerably to the time spent by the oncologist and physicist in the catheterization suite.

Because of vagaries of scheduling, procedure length and technical issues, it is difficult to schedule the entry of the "radiation team" into the treatment room on anything but a "more or less" basis. Thus the coordination of such an effort takes a dedicated team that is available to the patient on an "ad hoc" basis. While we and others try to minimize the disruption of the non-cardiologists' schedules by planning a "treatment day", certain patients do not have the luxury of waiting for an elective slot.

With an estimated 30-40,000 patients a year eligible for endovascular brachytherapy the coordination of these issues amongst the professionals on the team will present a challenge. In our experience, the physicist is the natural coordinator for the team on a daily basis.

Intravascular brachytherapy will be an important therapeutic tool over the next 1-5 years, and it behooves us to address our manpower needs now.

Educational Objectives: At the end of the presentation

- 1. The participants will be able to describe the magnitude of the problem of coronary restenosis
- 2. Will understand the pivotal role of intra-coronary brachytherapy in the treatment of this problem
- 3. Will understand the logistics and manpower needs for the institution of bracytherapy.