

Prof. Brian Griffin: radiation heart disease

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Prof. Brian Griffin (*Figure 1*), MD FACC, is Head, Section of Cardiovascular Imaging and Physician Director of Development at Cleveland Clinic's Heart and Vascular Institute and the John and Rosemary Brown Chair in Cardiovascular Medicine. His research interests focus on valvular heart disease and cardiac imaging.

Prof. Griffin has been invited to many international conferences and has published more than 160 articles in cardiology. *Cardiovascular Diagnosis and Therapy (CDT)* editor met Prof. Griffin during the 17th South International Congress of Cardiology in Guangzhou, China, where he gave a lecture on "Radiation heart disease". We are honored to have an interview with Prof. Griffin to share his opinions on radiation heart disease with our readers.

CDT: What mainly cause radiation heart disease?

Prof. Griffin: We know that the radiation kills not only cancer cells, but also damages normal cells. When radiation is used to treat breast cancer or other cancers, it unfortunately impacts the heart at the same time. Radiation therapy is the major cause of radiation heart disease. There has been much improvement at protecting the heart during radiation procedures but still unfortunately many people end up with some damage to the heart. It takes many years from 10-30 years for the effect because the tissue slowly becomes fibrotic and starts to develop significant thickening, which causes damage to the valves, pericardium and blood vessels. When high dose of radiation impacts the heart without adequate protection, people may develop damage to the heart muscle itself, or what we call restrictive cardiomyopathy. The extent of damage caused by radiation to the heart may be very substantial. Sometimes, we may be unaware that people have had radiation in the past, so we may fail to recognize that radiation is a significant contributor to their heart problems. It is important to recognize radiation heart disease as treatment options may be different or more limited when this is the main factor in a patient's heart disease. Radiation heart disease is an interesting and important problem right now and



Figure 1 Professor Brian Griffin.

we are really only just beginning to understand its clinical manifestations. Most cardiologists don't realize how significant the process can be when they first see radiation heart disease.

CDT: What is the status of the radiation heart disease in China and US? Does it cause much attention in the field?

Prof. Griffin: I am unaware of the prevalence of radiation heart disease in China. In the USA, it is only in the last number of years that radiation heart disease has become common as radiation particularly to the breast and to the chest only has been used therapeutically since the 1960s, 1970s and 1980s. These people are now 20-30 years out from the radiation exposure and it's at that time that heart problems tend to surface.

At Cleveland Clinic we see many of these patients as we are a national referral site. Typically, I will see two or three of these patients in a week. Some are sicker than others. As I saw more of these people, I realized that they require more attention and more study.

In the US now, there is increasing awareness of treatment of radiation heart disease and people are much more aware of the significance of the problem because of the number of published papers and documents on how to

treat and manage this disease increases. It is not a large scale population problem because we don't see thousands of patients. However, these patients do need to be looked at very specifically. We hope to screen those exposed to cardiac radiation so we can detect disease earlier. We are considering trying to intervene with medical therapies such as statins which might slow the way that the disease progresses but we don't know whether that will be effective. We plan to study the effect of medication in those exposed in order to determine whether preventive therapy can reduce long-term disease burden and improve outcomes.

CDT: *You have made a brief introduction about how to assess the radiation heart disease in your lecture. Could you give more detail about it to our readers?*

Prof. Griffin: We are now recommended to screen for radiation heart disease every few years after radiation therapy to the chest in order to detect the problem early. The regular physical examination is a vital way to improve the prognosis of radiation heart disease. After 5 years, if there is no evidence of cardiovascular problems, they could have an echocardiogram. And after 10 years, they should be considered for stress testing. If they have cardiovascular disease on examination or from history, at an earlier point, they should have an echocardiogram and probably a stress test. People who have more advanced disease and significant coronary or valve problems should have CAT-scan of the heart and chest. These scan do not just look the heart but can also detect radiation induced fibrosis within the lungs. If there is a lot of lung fibrosis, those patients will have high risk for open heart surgery and do try to avoid it if we have other alternatives such as TAVR or percutaneous coronary intervention. We also find that people who have open heart surgery after receiving radiation are harder to operate on because of fibrosis of the tissues and absence of well-defined tissue planes. Occasionally the aortic root is severely calcified which makes surgical cannulation and cross-clamping both difficult and dangerous. We have found that reoperation after an initial open heart operation is associated with much greater risk in radiation patients than in normal mainly because of cardiopulmonary complications especially restrictive lung disease or recurrent severe pleural effusions. We now try to avoid second open heart operations in patients with radiation by trying to perform the most definitive procedure we can on the first occasion and using mechanical rather than tissue valves in younger patients to prevent the need for

further valve surgery. Additionally, we may try to use PCI or percutaneous valve approaches in these patients if they have already undergone prior cardiac surgery. To deal with the problems our diagnostic evaluation in patients with radiation disease is to perform high quality echocardiogram with LV strain, a CT scan to assess vascular calcification, relationship of heart to sternum and presence and severity of lung fibrosis. We also perform a right and left heart catheterization to assess the intracardiac pressures and cardiac output and exclude pericardial constriction. Some patients may have unexpectedly low cardiac index which may be the first indicator of a constrictive or restrictive problem and is usually associated with a poor prognosis. We also evaluate their carotid arteries and their pulmonary function tests.

CDT: *What do you think is the most challenge during the therapy of radiation heart disease?*

Prof. Griffin: The most challenging problem at this time is that patients feel that they are just the same as other heart patients and expect the same great outcomes that we get for our other cardiac patients without radiation. But unfortunately, as we recently reported in circulation, this is not the case. Radiation patients may have more limited options as I described already and their longer term outcomes are worse than a similar patient without radiation. It takes considerable time to explain this to the radiation patient.

In terms of the most difficult medical issue, it is probably that these patients have developed fibrosis of the lungs. Their lung volumes often contract after surgery because of fibrosis or from recurrent pleural effusions likely caused by damaged lymphatics from radiation damage. Patients with severely restricted lung volumes may be difficult to help as lung transplant may not be feasible, and some of my patients have ended up on home ventilation.

CDT: *As the radiation heart disease is difficult to be aware of, what could we do to improve the prognosis of radiation heart disease?*

Prof. Griffin: We are starting to screen patients exposed to chest radiation to try and see whether we can intervene before the disease becomes so severe so that we can improve their long-term outcome. It may take another complete decade before we know that. The other hope is that radiation doctors are trying to protect the heart more

effectively when performing radiation.

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Footnote

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