



Another Perspective on Cardio-Oncology: Insights from Houston, Texas

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We had the pleasure of reviewing “A minimalist cardio-oncology service: A personal experience from Wales¹,” in which the authors report indications, access to care, provided services, and challenges for patients with cancer and heart disease in Wales. Our group faced similar challenges almost two decades ago, in a different health care system. This editorial will try to relive this journey on a different longitude and latitude to hopefully provide an optimistic second perspective. As the field of oncology expands, cardio-oncology will hopefully parallel the trajectory of cancer as a disease. From the now classical cardiotoxicities — anthracycline and trastuzumab or radiation induced heart disease, we now face an explosion of novel cancer therapies, paramount being the Bruton tyrosine kinase (BTK) inhibitors, monoclonal antibodies (Bevacizumab), tyrosine kinase inhibitors (TKIs), immune check point inhibitors (ICIs), and CAR T-cell therapy, all of which are associated with some degree of cardiac toxicity. Our perspective and approach can hopefully provide opportunities to expand the scope of practice and overall improve cardiovascular care.

Recognized under multiple names, Cardiology-Oncology, Onco-Cardiology, “Cancer and the Heart,” etc., the roots of this field date back to 1967 when daunorubicin-induced cardiotoxicity was first recognized. Medical practice in the 1970's included recognizing toxicities from “life-saving” cancer therapies, predominantly chemotherapy (anthracycline based)² and radiation therapy³, with the aid of physical examination, imaging (CXR), and cardiovascular studies (electrocardiogram or ECG and echocardiography).⁴ Treatments were either continued at prohibitive risk for the patient, held indefinitely, or alternatively, less cardiotoxic therapies were considered. Physicians were internal medicine doctors with particular interest in patients with cancer. The “beginnings” period spanned from 1970-2000, and the field was coined “Cardio-Oncology” in 1996.⁵

MD Anderson Cancer Center in Houston, Texas has been one of the top two cancer hospitals in the United States since the U.S. News & World Report survey began in 1990, holding the number one rank for the last 16 years. MD Anderson is one of the largest cancer centers in the world, with 25,000 employees including more than 1,900 faculty members working in more than 25 buildings across Houston and Central Texas (Figure 1).

The Department of Cardiology at MD Anderson was founded in 2000 as the first cardio-oncology unit in the world. Its goal is to

provide comprehensive cardiac care to patients with cancer and address cardiovascular complications following cancer therapy and co-existing cardiac conditions. At first, the department was comprised of three clinical cardiologists and a comprehensive research team. The vision of the department was to be the model for cardio-oncology units throughout the world. From 2000-2008, new concepts were evolving in practice: **cardio-protection** became a priority, cardiac toxicities were recognized, and patients were **rechallenged** with the few life-saving therapies available.⁶

In November 2009, MD Anderson Cancer Center opened the *first cardiac catheterization laboratory in a cancer center in the world*. A year later, more than 200 physicians, scientists, and healthcare professionals from 14 countries gathered in Houston, Texas for the First International Conference on Cancer and the Heart. This First International Conference was organized by the University of Texas MD Anderson Cancer Center and the Texas Heart Institute, two international leaders in the treatment of cancer and heart disease, and included both translational and clinical research. This *First International Conference* heralded the coming of cardio-oncology as a research and clinical subspecialty.⁷ The first systematic approach to cardiac catheterization and thrombocytopenia was presented and included 30 consecutive patients who underwent endovascular procedures. It established procedural safety in patients with thrombocytopenia with platelet counts as low as 10,000 platelets per mm³, a practice changing feat in interventional cardiology for patients deemed especially high bleeding risk.⁸ As is typical in a new field, the community of clinicians established the *International Cardio-Oncology Society* in 2010, which has played a substantial role in the recognition and treatment of the field's clinical challenges.⁹

Improvement in cancer and cardiovascular therapy has led to an increasing number of cancer survivors with complex cardiovascular diseases. As the field of cardio-oncology evolved, it became clear that these patients were best managed by a team of cardiologists subspecialized in the fields of advanced cardiac imaging, electrophysiology, and interventional cardiology. In 2015, a national survey outlined the “roadmap to the next level” to adapt to the emerging complexity of cancer treatment induced cardiotoxicities. The roadmap outlined the need for advanced cardiac imaging (i.e., use of echocardiography with strain and 3D imaging, cardiac CT, and cardiac MRI), advanced heart failure care, interventional cardiology procedures, and electrophysiology. The survey recognized the clinical relevance of the field, but emphasized the “lack of national guidelines, lack of funds, and limited awareness and infrastructure.”¹⁰

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Figure 1 - MD Anderson Cancer Center – Texas Medical Center in Houston, TX.

In 2016, the Society for Cardiovascular Angiography and Interventions (SCAI) commissioned a group of cardiologists from large academic centers and community groups with extensive experience in cardio-oncology to present the already accumulated experience in the cardiac catheterization laboratory in patients with cancer.¹¹ This led to an awareness of the importance of timely and appropriate cardiovascular interventions in patients with cancer and the establishment of interventional cardio-oncologist as a subspecialty.

Similar efforts to standardize clinical practice led to the “Expert consensus for multimodality imaging evaluation of adult patients during and after cancer therapy: a report from the American Society of Echocardiography and the European Association of Cardiovascular Imaging”¹² and the “Cardiac computed tomographic imaging in cardio-oncology: An expert consensus document of the Society of Cardiovascular Computed Tomography (SCCT)”¹³, both endorsed by the International Cardio-Oncology Society (ICOS) and the recent ESC Guidelines.

Patients with cancer represent the ideal substrate for type II myocardial infarction as anemia, hypotension/hypertension, tachycardia, inflammatory, and adrenergic responses are common in the treatment course. Patients presenting with shortness of breath (the most common presentation for ACS in patients with cancer)¹⁴, abnormal ECG, or elevated cardiac biomarkers have a broad differential diagnosis. We found that “*early invasive strategy*” and the mnemonic “**TAMPA**” are helpful guides for daily clinical practice:

- **T** = Stress induced cardiomyopathy (Takotsubo)/Tumor infiltrating the heart/leukemic infiltrates in the myocardium
- **A** = Amyloidosis and other restrictive cardiomyopathies

- **M** = Myocarditis (from immune checkpoint inhibitors (ICI's) or viral etiology)
- **P** = MyoPericarditis (from treatments involving the mediastinum, i.e., surgical, chemotherapy, radiation) and Pulmonary embolism
- **A** = Acute Coronary Syndrome

Our conviction is that an *optimal cardiovascular status* is essential for navigating the tumultuous journey of cancer treatment. Therefore, addressing significant cardiovascular pathology such as *acute myocardial infarction/multivessel coronary artery disease, large pericardial effusion*¹⁵, and *severe aortic stenosis*^{16,17} early during cancer therapy is imperative for quality of life and improvement in survival. Data have shown that chance of survival increases with timely aortic valve replacement (AVR) in cancer patients with severe aortic stenosis¹⁸. Prospective registries have attempted to clarify when and how to treat severe aortic stenosis in patients with cancer, what type of valves to use, and how early cancer therapy can be safely resumed.¹⁹ Another example is of preferentially using transcatheter aortic valve implantation (TAVI) in patients with cancer and severe aortic stenosis, as the time to initiation or resumption of cancer therapy following AVR is significantly shorter for patients who undergo TAVI than for those who undergo surgical AVR.²⁰

Cancer care is personalized because every patient is unique; therefore, randomized prospective cardiovascular studies are close to non-existent. Precision in cardiovascular care may be utilized to enhance precision in cancer care. The recent use of artificial-intelligence, large data, and prospective registries are attempts in closing this gap. They provide invaluable information for rare diseases, helping us address systemic and systematic challenges.^{21,22}

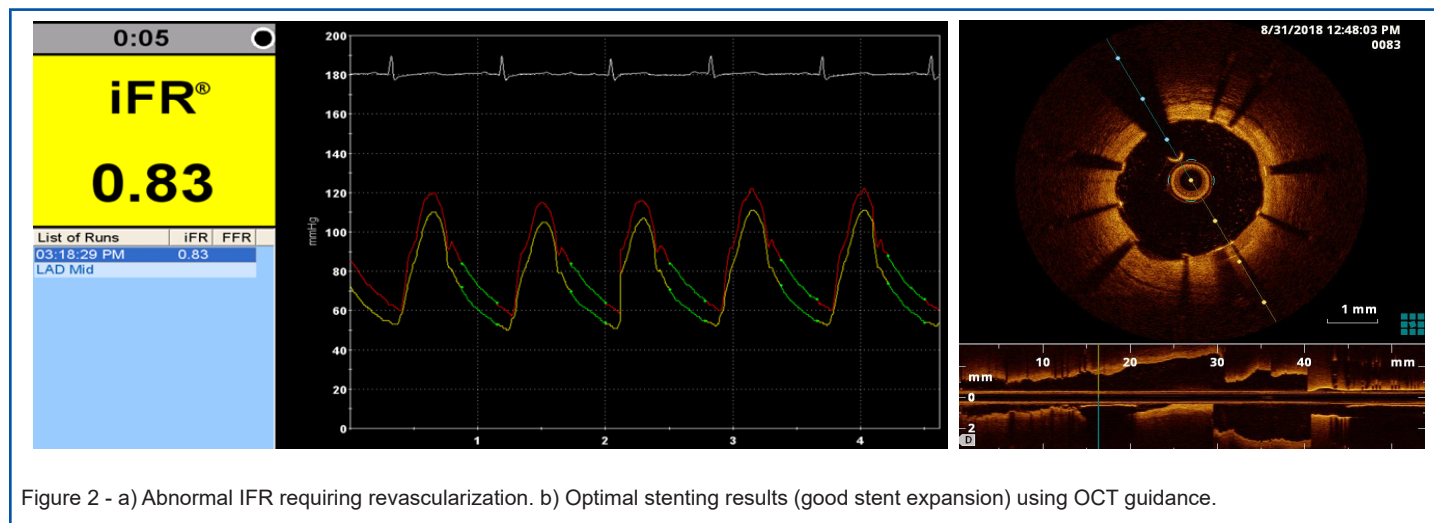


Figure 2 - a) Abnormal IFR requiring revascularization. b) Optimal stenting results (good stent expansion) using OCT guidance.

Precision cardiovascular care using functional assessment, iFR/FFR, or intravascular imaging (IVUS/OCT) is of paramount importance to avoid unnecessary procedures, while optimizing and improving results in the indicated cases (Figure 2).²³⁻²⁶

Amongst patients with carcinoid heart disease, it is essential to identify the correct timing of valve replacement, identify the type of valve to use, and create an active monitoring schedule to improve the significant gap in knowledge between centers.^{27,28}

The existing evidence in cardio-oncology is predominantly a mixture of existing data with accumulated clinical experience, setting the foundation for additional pioneering.²⁹ With the addition of immune check point inhibitors (ICI's), the field if anything will become even more complex. There is a myriad of information to understand and response to. We found it useful to follow credible leaders in the field and try to embed their experience in our practice.

Our desire was to create an initial experience; our efforts were to create a path. The next generation of young, talented clinicians and scientists will improve the existing ones and create new pathways. The best is yet to come. While in different stages, both experiences (in Houston and in Wales) reflect the need for cardiovascular care in patients with cancer and the effort to recognize, define, and practice it. Time will make systems more aware of the need, address the deficiencies, and in the end deliver better care for this high-risk population.

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After almost two decades of practicing cardio-oncology, we recognize the amazing opportunity to serve these patients and improve their longevity and quality of life. We owe everything to our patients who need our unwavering support and compassionate care. We hope to continue our endeavors to consistently improve this field and the quality of life of our patients.

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Conflict of interests

none to declare.

Consent

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