OncoLOGic Proton Beam Therapy in Patients with Cardiac Implantable Electronic Devices

Martin Van Zyl MBChB; Anvi Raina; Sarah Schroeder; Shawn J. Anderson BSN; Nicholas Remmes; David J. Bradley and Yong-Mei Cha MD, FHRS

Background: Proton beam therapy (PBT) is an attractive treatment for malignancy owing to its high precision on target tissue while sparing adjacent sites. The safety of PBT in patients with cardiac implantable electronic devices (CIEDs) remains unclear.

Objective: To analyze CIED interrogation data in patients who have undergone PBT.

Methods: Consecutive patients with CIEDs who underwent PBT between 2016-2020 at Mayo Clinic in Rochester, MN were prospectively studied. A multidisciplinary team (radiation oncology, cardiology, and anesthesiology) established a practice protocol. CIEDs were interrogated at baseline then daily (if dependent) or weekly following PBT.

Results: A total of 707 CIED interrogations were performed in 59 patients (age 73\(\pm\)11.3 years; 23.7\% female; BMI 28.7\(\pm\)5.6) who underwent PBT for thoracic (47.5\%) as well as abdominal, pelvic, head and neck malignancies. CIEDs were right sided in 7 (11.8\%), defibrillators were present in 17 (28.9\%), and 11 (18.6\%) were pacemaker dependant. Battery longevity decreased modestly after PBT (6.69\(\pm\)3.49 vs. 6.66\(\pm\)3.47 yrs, \(p=0.01\)). No difference was seen in sensing amplitude (7.85\(\pm\)5.89 vs. 7.98\(\pm\)5.92 mV, \(p=0.68\)), lead impedance (545\(\pm\)208 vs. 548\(\pm\)206 \(\Omega\), \(p=0.49\)), or pacing threshold (0.38\(\pm\)0.27 vs. 0.38\(\pm\)0.27 V*ms, \(p=0.29\)). Power-on reset occurred in 3 patients (5.1\%) with thoracic PBT - none resulting in harm. There were no reports of inability to interrogate, unexpected early replacement, loss-of-pacing, or inappropriate shocks.

Conclusion: PBT can be performed with minimal effect on CIED function. Battery longevity may be impacted modestly by PBT and/or frequent interrogation. Caution needs to be taken in patients undergoing thoracic PBT given a small risk of power-on reset.

Intra-Operative Findings with Massive Device-Related Thrombus After Percutaneous Left Atrial Appendage Closure: Mechanistic Insights

Kashif Malik MD; Rong Bai MD, FHRS; Damir Vukomanovic MD; Alicia Taase MD; Eleanor Kitchell MD; Rinku Skaria MD; Roderick Tung MD, FHRS; Kenith Fang MD and Michael S. Zawaneh MD

Background: Left atrial appendage closure (LAAC) devices are an alternative to antithrombotic therapy for stroke prevention in high-risk patients with atrial fibrillation who are not candidates for systemic anticoagulation. However, device related thrombus (DRT) has an observed incidence of ~4\% after LAAC. The mechanism of massive thrombus formation remains incompletely understood.

Objective: To present and examine the intraoperative findings of 2 cases of massive DRT occurring late post LAAC device implantation and propose potential mechanisms for these rare complications.

Methods: N/A

Results: Patient 1 was a 75-year-old female with paroxysmal AF and CHA2DS2-VASc Score of 5 with Watchman implanted two years prior to presentation. She had completed 45 days of warfarin and ASA after implantation. She underwent elective open heart surgery for severe mitral valve regurgitation and moderate to severe aortic valve regurgitation. Large DRT (2x2cm) was diagnosed intraoperatively, which was treated with left atrial appendage and device resection. Patient 2 was a 75-year-old female with permanent AF and CHA2DS2-VASc Score of 5 with Watchman implanted two years prior to presentation. She had completed 45 days of warfarin and ASA after implantation. She underwent elective open heart surgery for severe mitral valve regurgitation and moderate to severe aortic valve regurgitation. Large DRT (2x2cm) was diagnosed intraoperatively, which was treated with left atrial appendage and device resection.