Strategies to reduce complications in complex device procedures such as ICD and CRTD implantation: a decade long contemporary single-centre experience

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Introduction: A new implantable cardiac defibrillator (ICD) and cardiac resynchronization therapy (CRT) service was commenced at Tauranga Hospital in 2009 by two relatively inexperienced operators. Significant attention was placed in implementing strategies to prevent complications involving all aspects of the service. Two specific procedural strategies employed include routine use of cephalic vein access and positioning of right ventricular (RV) lead in a septal position as default position. A device database was established to record demographics, procedural characteristics and complications. We reviewed results of all ICD and CRTD procedures at our centre over 10-years.

Methods: Data for consecutive patients undergoing ICD and CRTD implantation or replacement at Tauranga Hospital from 2009-2018 were collected for characteristics and outcomes from electronic records and device database. Two authors collected the data to ensure accuracy. Short term followup was available for all patients, and long term for 96.3% of patients as they remained in the region.

Result: A total of 307 procedures were audited, 72% were elective procedures. Mean age was 63 +/- 12 years, 80% were male. Ethnic distribution was predominantly New Zealand European 60% and Maori 28%. New ICDs were implanted in 184 (60%) and CRTDs in 53 (17%). Generator device replacements were performed in 70 (23%) patients. Four device manufacturers were used including Medtronic 36%, Biotronik 25%, St Jude 18% and Boston Scientific 21%. Figure 1 shows the breakdown of venous access strategies and figure 2 illustrates RV lead positioning. Median procedural time for new ICD implants was 60 (49-70) minutes and CRTDs 139 (106-169) minutes. There were 15 (4.9%) operative complications in total displayed in figure 3. Requirement for lead repositioning occurred in 5 (1.6%) with 3 out of 4 repositioned RV leads positioned at RV apex initially. Haematoma requiring drainage, cessation of anticoagulant or hospitalisation occurred in 5 (1.6%). Resiting battery unit was needed in 2 (0.6%) patients. Infection requiring device and lead removal, lead fracture at unit replacement and phrenic nerve stimulation forcing abandonment of left ventricular pacing occurred in 1 (0.3%) each. There were no pneumothorax, stroke, cardiac perforation, tamponade or death. ICD therapy occurred in 106 (34.5%), with first therapy at median of 0.8 years post implantation, 25.5% were inappropriate. Mean device longevity until replacement was 6.6 +/- 1.7 years.

Conclusion: The total procedural complication rate is low at 4.9% despite being the first 10-year experience of complex device implantation for two inexperienced operators. In particular there were no serious complications such as pneumothorax, cardiac perforation, tamponade or death. We attribute this low complication rate to our implementation of strategies aimed at reducing these events.