Methods A prospective analysis of all Micra VA implants performed at Royal Papworth Hospital was carried out. This included pacing checks for up to 24 months post device insertion, evaluating complications and specifically noting thresholds and R-wave amplitude changes.

Results A total of 24 Micra leadless pacemakers were implanted at our centre between 2017 and 2020. The age range for the patients was 37 to 92 years, mean age 71 ± 13 yrs. 8 out of 24 (33%) patients had poor venous access, with bilateral subclavian obstruction, requiring the use of a leadless pacemaker. 2 out of 24 had bilateral previous pacemaker infections and extraction. For the remaining patients, 12/24 (50%) had atrial fibrillation with slow ventricular response as the primary indication for the device. 6 out of 24 (25%) patients had a history of LV impairment (4 patients severe LVSD, 2 moderate LVSD). One patient had a previous cardiac transplant. The implant was successful for all patients. One patient required the procedure to be repeated under general anaesthetic as she did not tolerate the insertion of the femoral sheath under sedation. 2 patients (8%) required repositioning of the device during the case, as initial placement was unsatisfactory. 23/24 patients had the device placed in the septum and 1 patient in the RV apex. This patient had undergone multiple previous tricuspid valve surgeries, which made septal positioning challenging, and so an apical placement was accepted. Mean procedure time was 62 ± 16 mins. Mean fluoroscopy time was 5.8 ± 4.2 mins. Implant threshold was $0.6 \text{ V} \pm 0.4 \text{ V}$. Threshold at 1 year follow up was $0.5 \text{ V} \pm 0.2 \text{ V}$ and $0.6 \text{ V} \pm 0.2 \text{ V}$ at 2 years. Paired T testing showed no statistically significant difference in threshold values at implant, and year 1 ($p = 0.7$, $n = 13$), or implant and year 2 ($p = 0.78$, $n = 6$). The R wave at implant was $9.5 \pm 4.1 \text{ mV}$, and $9.8 \text{ mV} \pm 2.5 \text{ mV}$ at year 1, again with no statistically significant difference ($p = 0.87$, $n = 13$). Mean battery life at 2 year follow up was 7 ± 0.5 years. Pacing percentages varied from 0.1% to 99.99%.

Conclusion Although the numbers are small, particularly for follow up over 2 years ($n = 6$), the initial results are encouraging, and support a low complication rate, and no evidence of premature battery failure or issues with device threshold requiring re intervention. It is imperative that further studies are carried out to give a picture of longer term follow up for the leadless Micra VA pacemaker focussing on these two key issues.

Conflict of Interest nil

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IMPLANTABLE CARDIOVERTER-DEFIBRILLATORS IN THE ELDERLY: A SINGLE-CENTRE OBSERVATIONAL STUDY ON OUTCOMES IN OCTOGENARIANS

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Introduction Implantable cardioverter-defibrillators (ICDs) are well-established therapy for sudden cardiac death (SCD) prevention. However, the average age of patients in both primary and secondary prevention clinical trials of ICDs has been in the 60s, with less than 25% of included participants above the age of 75. As such, data supporting the clinical and cost-effectiveness of ICDs in this understudied age group is

lacking. We aim to review the outcome of patients > 80 years of age with ICD therapy in a district general hospital serving an elderly population.

Methods Patients > 80 years of age who underwent ICD implantation between 2015 and 2017 were identified from the hospital electronic records. Conventional ICD and cardiac resynchronisation therapy with defibrillator (CRT-D) implants were included. Primary outcomes include overall all-cause mortality at time of data collection and at 1-year following implant. Secondary outcomes include number of patients receiving appropriate and inappropriate therapy and complication rates.

Results We identified 38 patients >80 years of age who underwent a defibrillator implantation in this period. 17 and 21 patients received an ICD and CRT-D respectively. 29 (76%) were male and the mean age at implant is 83.3 years. The mean follow-up period was 37.3 months (range: 6 – 51 months). The average number of co-morbidities per patient was 4. The most common comorbidities were heart failure with reduced ejection fraction (32/38), ischaemic heart disease (27/38), hypertension (22/38) and atrial fibrillation (21/38). 11 of 38 patients had chronic kidney disease. 25 patients (66%) underwent ICD implantation as primary prevention therapy. The overall mortality rate was 26.3% and the 1-year mortality rate was 2.6%. The average time to death from implant was 2.2 years. 6 patients (16%) received appropriate shocks during the follow-up period. No patients received inappropriate shocks. There were no acute or late complications from device implantation in the follow-up period.

Conclusion In this single-centre observational study, ICD implantation in octogenarians had a low complication rate. The majority of patients survived beyond 12 months, although the average time from implant to death was just over 2 years. ICD therapy may be beneficial in octogenarians and patients should be considered for ICD therapy after careful selection and counselling of risks and benefits. Further work is required to identify patients in this age group whom may benefit the most from ICD therapy.

Conflict of Interest None

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A MIXED-REALITY HOLOGRAPHIC VIEWING PLATFORM ENABLING INTERACTION WITH 3D ELECTROANATOMICAL MAPS USING THE HOLOLENS

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Introduction Three dimensional (3D) electroanatomical maps (EAMs) created during electrophysiology procedures are traditionally displayed on 2D monitors connected to mapping systems. This has limitations, such as the lack of interaction with EAMs, the need for another user to control them, and the size of EAM displayed, which is limited by the resolution of these monitors. To overcome these, we created a novel technology to display EAMs on a mixed reality (MR) platform.

Methods We used the Microsoft® HoloLens to create this MR platform. Studies from patients who had already undergone catheter ablation for atrial fibrillation, where EAMs of

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the left atria had been generated using different mapping systems (CARTO®, Rhythmia™ and EnSite Precision™) were utilised. These EAMs consisting of 3D coordinates and annotations (e.g. voltage & activation times) were exported from the mapping system. EAMs were then compiled and transferred to the HoloLens using custom-developed functions on Unity®, Microsoft® C# and VisualStudio. Subsequently, feedback was obtained from 3 independent electrophysiologists on this technology.

Results We successfully exported the EAMs generated on CARTO®, Rhythmia™ and EnSite Precision™ mapping systems as holograms on to the HoloLens (Figure). Positive feedback included themes such as 1) the ability to use hand gestures and voice commands to interact with EAMs independent of another user unlike traditional cardiac mapping systems 2) offering an interactive 3D holographic experience whilst preserving the operators' physical interaction in the cardiac catheter lab 3) the capacity to better appreciate 3D geometry of EAMs in comparison to 2D monitors. The challenge of wearing a headset during long procedures was perceived as a disadvantage.

Conclusion This technology, which can be used with any mapping system, is currently optimised for offline display. Our software will be made available as an opensource teaching and simulation tool (at www.Openep.io). Users will be able to explore EAMs for research, planning complex cases and immersive learning. The future directions will include extending this toolkit for real-time cardiac mapping with catheter localisation, and could potentially be translated to other cardiac imaging modalities.

Conflict of Interest None

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SYSTEMIC REVIEW OF ALLERGIES AND TREATMENT TO COMPONENTS OF CARDIAC IMPLANTABLE ELECTRONIC DEVICES

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Background Components of Cardiac Implantable Electronic Devices (CIEDs) consist of polymers and metallic alloys. Although they are rare, there are documented cases of allergic reactions to components of CIEDs. These are commonly misdiagnosed as device pocket infections leading to wasted resources and potentially serious consequences for the patient.

Methods We conducted a systematic literature review to identify reported cases of allergic reactions to components of CIEDs and their treatment/management. The words 'pace-maker', 'cardiac implantable electronic device', 'cardiac rhythm device', 'implantable cardiac defibrillator' or 'cardiac resynchronization therapy' in combination with 'replacement' or 'treatment' were used as search criteria.

Results We identified a total of 32 case reports of Allergic reactions to components of CIEDs. Of these 25 were PPMs (Permanent Pace Makers) and 7 were ICDs (Implantable Cardioverter Defibrillator) (1 CRTD - Cardiac Resynchronization Therapy Device). 18 reported hypersensitivity reactions were to alloys or metals and 13, due to polymers. In 1 case, patch testing showed positivity to multiple allergens but a single, causative material was not identified. The onset of symptoms as a result of these reactions showed wide variation, ranging from 1 day to 10 years post CIED implant. The most common metal allergen was Titanium and the most common polymer was Epoxy Resin. Patient's history, clinical examination and patch testing were used to diagnose allergic reactions to CIED components. Management of the allergic reactions varied depending on the severity. Topical steroids were used for limited cutaneous reactions, while in more deep seated reactions, a complete system extraction with re-implantation of a Gold coated CIED was performed.

Conclusion Allergic reactions to CIEDs are rare but important complications. It is important to identify this pathology early in order to manage patients optimally to minimize harm.

Conflict of Interest None

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IMPACT OF COVID-19 PANDEMIC ON IN-PATIENT MORTALITY OF PATIENTS WITH IMPLANTABLE CARDIAC DEVICES

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Background Patients with cardiovascular disease have a higher risk of death from COVID-19 infection. Most patients with implantable cardiac devices (pacemakers and defibrillators) have significant cardiovascular co-morbidities, which would suggest a higher mortality in device patients during the pandemic. **Aim** To review inpatient mortality of patients with cardiac devices in our hospital before and after the outbreak of the COVID-19 pandemic. **Method** A retrospective analysis of all in-hospital deaths over 12 months, between 1st November 2019 and 31st October 2020, at a district general hospital in the UK. All patients with implantable cardiac devices were