**SUPPLEMENTARY SECTION**

**METHODS**

**Atrial fibrillation ablation protocols**

All AF ablations were performed in a standard fashion on uninterrupted therapeutic anticoagulation. After general anaesthesia and oro-tracheal intubation, transoesophageal echocardiography was performed to rule out the presence of thrombus. After femoral venous access, LA access was obtained through one or two atrial trans-septal punctures performed under fluoroscopic and trans-oesophageal guidance. Heparin was administered to achieve and maintain Activated Clotting Time (ACT) values of 300-400 seconds throughout the procedure. Radiofrequency energy, cryoballoon or laser balloon were used for PVI as per operator preference.

When using RF energy, a 3D electroanatomic mapping system was used (EnSite Velocity, Abbott Medical, St Paul, MN, USA or CARTO mapping system, Biosense Webster, Inc, CA) to construct the LA and PVs geometry with a circular mapping catheter (Optima, Abbott Medical, St Paul, MN, USA or Lasso, Biosense Webster, Inc, CA, respectively). An irrigated-tip contact force sensing ablation catheter (Tacticath Quartz, Abbott Medical, St Paul, MN, USA or Thermocool SmartTouch, Biosense Webster, Inc, CA) was used for ablation through a deflectable sheath (Agilis, Abbott Medical, St Paul, MN, USA). Wide area antral PVI was performed in all patients using point-by-point ablation, with delivery of contiguous lesions on a predetermined encirclement. A 40W power was used for ablation, aiming at a minimum contact force of 10 gr and targeting Lesion Size Index (LSI) values of 5/Ablation Index (AI) values of 400 posteriorly and LSI values of 6/AI values of 550 anteriorly. The left and right veins were treated as pairs, with additional ablation performed at the carina between upper and lower veins if circumferential encirclement failed to isolate both veins. Pulmonary Vein Isolation was confirmed by disappearance of PV potentials or evidence of dissociated PV potentials and PV entrance and exit block with pacing.

When using cryoenergy, LA and PV angiography were performed to delineate anatomy. A FlexCath (Medtronic, Minneapolis, MN, USA) was advanced to the LA and used to deliver a 28 mm Arctic Front Advance cryoablation balloon (Medtronic, Minneapolis, MN, USA). The balloon was inflated at the ostium of each PV. After retrograde PV angiography, to demonstrate PV occlusion, one or more 4-minute freezes were performed in each PV until PVI was achieved. Pulmonary Vein Isolation was confirmed by disappearance of PV potentials or evidence of dissociated PV potentials and PV entrance and exit block with pacing, by using an Achieve guidewire (Medtronic, Minneapolis, MN, USA).

When using laser energy, a laser balloon system (HeartLight, CardioFocus) was delivered to the LA through a 12-F deflectable sheath and inflated at the ostium of each PV. Ablation lesions were delivered in a circumferential, contiguous, and overlapping manner around the PV using 5–12 W power whilst simultaneously undertaking oesophageal temperature monitoring. Pulmonary Vein isolation was confirmed by disappearance of PV potentials or evidence of dissociated PV potentials and PV entrance and exit block with pacing, by using an Achieve guidewire (Medtronic, Minneapolis, MN, USA).

**RESULTS**

**Study population**

**Table A. Patients' baseline characteristics**

|  |  |
| --- | --- |
| Total number of patients | 12 |
| Age (years), mean ± SD | 64.8 ± 11.8 |
| Sex (males), number of patients (%) | 4 (33%) |
| Diabetes, number of patients (%) | 1 (8.3%) |
| Hypertension, number of patients (%) | 4 (33%) |
| Previous stroke, number of patients (%) | 1 (8.33%) |
| AF duration (months), median (IQR) | 18 (12-28)  |
| AADs tried (number), median (IQR) | 2 (1-3) |
| LA volume index (ml/m2), mean ± SD | 28.6 ± 4.6 |
| LV systolic function (%), mean ± SD | 57.1 ± 6.6 |
| CHA2DS2-Vasc score, median (IQR) | 1 (0-3) |

**Legend:** AADs= Antiarrhythmic drugs; AF= atrial fibrillation; IQR= Interquartile range; LA= left atrial; LV= left ventricular; SD= standard deviation.

**Performance of ICE/IVUS for PV imaging: inter-observer reproducibility of measurements**

Compared to IVUS, ICE performed better in terms of inter-observer reproducibility, as showed in Table B.

**Table B. Intraclass Correlation (ICC) values of ICE and IVUS measurements.**

|  |  |  |
| --- | --- | --- |
|  | **ICE** | **IVUS** |
| **Maximum lumen diameter** | 0.98 (95% CI: 0.97–0.99) | 0.95 (95% CI: 0.90-0.98) |
| **Minimum lumen diameter** | 0.96 (95% CI: 0.91–0.98) | 0.94 (95% CI: 0.92-0.96) |
| **Lumen area** | 0.98 (95% CI: 0.97–0.99) | 0.95 (95% CI: 0.91-0.97) |
| **Maximum vessel diameter** | 0.93 (95% CI: 0.88-0.95) | 0.72 (95% CI: 0.60-0.93) |
| **Minimum vessel diameter** | 0.91 (95% CI: 0.87-0.93) | 0.73 (95% CI: 0.70-0.88) |
| **Vessel area** | 0.92 (95% CI: 0.89-0.95) | 0.71 (95% CI: 0.61-0.90) |
| **Maximum wall thickness (mm)** | 0.88 (95% CI: 0.83–0.88) | 0.70 (95% CI: 0.63-0.89) |
| **Minimum wall thickness (mm)** | 0.89 (95% CI: 0.81–0.89) | 0.69 (95% CI: 0.64-0.91) |