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Three Dimensional Reconstructions of the Left Phrenic Nerve Anatomy in Relation to the Coronary Venous System

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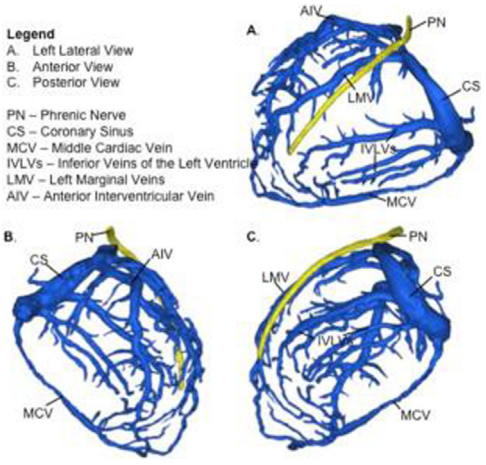
Background: Phrenic nerve stimulation (PNS) occurs during left-sided lead implantations within the coronary venous system in over a third of patients. An understanding of left phrenic nerve anatomy in relation to the coronary veins is essential for reducing PNS.
Methods: We obtained computed tomography (CT) scans while injecting contrast into the coronary veins of 13 perfusion-fixed human hearts with the pericardium and left phrenic nerve intact. In order to visualize the location of the phrenic nerve under CT, we glued a radiopaque wire to the nerve. We then created 3D models of the anatomy, displayed in Figure 1, and measured relevant anatomical parameters (Materialise, Leuven, Belgium).



Results: Table 1 presents the mean and standard deviations of various parameters relating to areas where the phrenic nerve centerline intersects with the underlying venous centerlines. The nerve intersected the closest to the left marginal veins, which are typically targeted for left-sided lead implantations.

Table 1. Mean and standard deviation values for various anatomical parameters that characterize the locations where the phrenic nerve overlays the coronary veins.

Vein	Prevalence of phrenic nerve overlapping	Shortest distance to the phrenic nerve (mm)	Distance to the coronary sinus (mm)	Distance to the coronary sinus ostium (mm)	Angle with the phrenic nerve (°)
Coronary Sinus	23.1%	10.2±4.7	NA	90.8±12.6	120.7±53.2
Middle Cardiac Vein	30.8%	4.9±4.1	97.4±2.8	111.7±7.3	102.8±63.3
Inferior Vein	53.8%	5.0±2.4	102.9±14.4	127.4±27.8	94.9±39.7
Left Marginal Vein	53.8%	4.5±2.6	42.1±26.1	120.9±27.0	112.6±37.3
Anterior Interventricular Vein	84.6%	7.2±4.1	27.5±16.8	98.1±55.0	104.7±55.0

Conclusions: We found that the phrenic nerve overlaps a left marginal vein in over half of the specimens in this sample. We will continue to expand this novel anatomical database to provide further insights for PNS reduction during left-sided pacing.

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Efficacy and safety of Refined Balloon Pulmonary Angioplasty for Inoperable Patients with Chronic Thromboembolic Pulmonary Hypertension: A Multicenter Study

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Background: Chronic Thromboembolic Pulmonary Hypertension (CTEPH) is known as a serious disease with poor prognosis. Pulmonary endarterectomy (PEA) is a treatment option, however, suitable indication is restricted within the proximal lesions and few hospitals routinely perform PEA. In the present situation, we have performed balloon pulmonary angioplasty (BPA) for the inoperable patients with CTEPH in the distal pulmonary arteries since 2004, and introduced the refined BPA using intravascular ultrasound system since 2006. The purpose of the study was to investigate the efficacy and safety of BPA for inoperable patients with CTEPH who hospitalized in Okayama Medical Center, Kagoshima Medical Center and Japanese Red Cross Kyoto Daiichi Hospital.
Methods: The eligible population consisted of the consecutive 141 patients with inoperative CTEPH who underwent refined BPAs (626 sessions) in the three collaborating hospitals. For the efficacy, we investigated WHO functional class, 6 minutes walk distance, cardiac parameters using catheterization and BNP level. For the safety, we evaluated major adverse event (emergent surgery, PCPS, mechanical ventilator, NPPV for more than two days) and minor event (reperfusion pulmonary injury without corresponding events mentioned above).
Results: The patients consisted of 30 males, 62.7 years at BPA, and the mean morbidity period from the onset to 1st BPA was 2.8 years. Before the 1st BPA, WHO-FC was 3.1, mean PAP: 44.9, Cardiac index: 2.4, PV resistance: 955.2, BNP: 268.3, 6 MWD: 266.3m, respectively. After BPA (average session number 3.0), WHO-FC was 1.9, mean PAP: 23.8, CI: 3.1, PVR: 321.7, BNP: 36.2, 6MWD: 357.1m, respectively. Mean PAP at follow up was 21.9. Major adverse events were 7 PCPS and 13 mechanical ventilator. As minor adverse events, the number of pulmonary edema was 148 (chest X-ray) and 308 (CT scan), and 116 showed bloody phlegm. In-hospital death was 5 (mortality 3.5%).
Conclusions: Although further improvement for equipment and technique should be required, refined BPA, which can safely improve the pulmonary circulation, is considered to be an effective treatment option for inoperable patients with CTEPH.

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Comparison of Outcomes in Percutaneous Device Closure of Patent Foramen Ovale Using Transesophageal And Intracardiac Echocardiography

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Background: Percutaneous closure of the patent foramen ovale (PFO) is a common procedure in structural cardiology and is mostly performed with transesophageal echocardiography (TEE) guidance under general anaesthetic (GA). The use of intracardiac echocardiography (ICE) has gained increased popularity as it avoids the need for general anaesthesia, thereby reducing procedural time, risk and length of hospital stay. This study compares clinical outcomes of PFO closure using ICE with TEE
Methods: We performed a retrospective analysis of 109 consecutive patients (mean±SEM 45±1.3 years, 56 male) undergoing elective PFO closure at a single centre between 2005 and 2012 (46 TEE, 63 ICE). The indications for closure include thromboembolic (n=91), Migraine (7), Decompression sickness (4) and other (7). Procedure data including duration, fluoroscopy time, radiation dose, contrast load and major complications were obtained. Follow up data at 3-6 months post procedure collected include symptom recurrence, atrial fibrillation and evidence of shunting on echocardiography.
Results: There were no major adverse procedural events in either group. Hospital stay and contrast usage were significantly lower in the ICE group. There was a non-significant trend towards lower radiation doses and shorter procedure duration in the ICE group. Follow up data was available in 104 patients (95%). There was no evidence of any significant shunting across the intra-atrial septum in any of the patients. 1 patient had bubble contrast detected late in the cardiac cycle which was felt to be not via the defect. 1 patient in the TEE group developed atrial fibrillation which was successfully cardioverted with no evidence of recurrence on further follow up.

Table 1. Data displayed in Mean±SEM unless otherwise stated

	ICE	TEE
Female / Male	30/33	23/23
Device size (mm)	25±0.26	25±0.33
Fluoroscopy time (min)	9.1±1.4	9±1.6
Total procedure time (min)	75±2.5	80±3.8
Contrast (ml)	36±2.2	48±4.2*
Radiation dose (cGycm2)	1431±186	1770±339
Same day discharge (n/%)	50 / 79%	19 / 43%*
*p<0.05		

Conclusions: Using ICE in PFO closure is associated with significantly shorter hospital stay, lower contrast usage and avoidance of GA. Procedural outcomes are comparable with both techniques.

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