Stem cell infusion into the vein of Marshall

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The vein of Marshall (VOM) and related cardiac ganglia have been clearly implicated in atrial fibrillation. Electrophysiological procedures have targeted these sites of autonomic innervation. However, targeting the exact sites has proven technically challenging. Identifying the VOM and infusing stem cells may ablate related ganglia autonomic function and offer an innovative treatment for atrial fibrillation.

A vasculopathic patient of 84 years with a history of chronic persistent atrial fibrillation, coronary artery bypass, aortic and tricuspid valve surgery, and a resynchronizing cardiac defibrillator underwent bone marrow harvesting. Pre-procedure investigations documented significant left atrial (LA) dilatation with a diameter of 69 mm. Pacermaker interrogation documented a 4-year history of chronic persistent atrial fibrillation. The patient gave informed consent to undergo a research procedure involving the infusion of stem cells via the coronary sinus for the treatment of congestive cardiac failure. Following preparation, harvested haematopoietic stem cells were actually infused into the vein of Marshall (VOM) from the coronary sinus via a right subclavian vein approach (Figure 1).

They were injected into the VOM rather than a ventricular branch as there were no other suitable targets. Twenty days following the procedure, the patient spontaneously cardioverted to sinus rhythm, and 15 months post-procedure, the patient remains in sinus rhythm.

Clinical studies have clearly implicated intrinsic cardiac ganglia in atrial fibrillation. Electrophysiological procedures have focused on ablating myocardial sites that participate in the initiation and perpetuation of atrial arrhythmia. The VOM is an LA vein that contains autonomic innervation, and atrial fibrillation may originate from the catecholamine-sensitive VOM or its ligament in addition to pulmonary veins. The VOM communicates directly with the underlying myocardium, as shown by echocardiographic contrast passage into the LA. Its location coincides with areas usually ablated during pulmonary vein antral isolation. Previous studies using ethanol infusion in the VOM achieves significant LA tissue ablation, abolishes local vagal responses, and is feasible in humans.1 In this case, stem cell infusion into the VOM resulted in spontaneous reversion to sinus rhythm. Elevated levels of ANP- and MEF-2-positive cells are thought to promote hematopoietic progenitor cells into cardiomyocytes, and thereby may contribute to myocardial (atrial) tissue repair.2 Further studies are required to identify whether stem cells have a unique role in the treatment of atrial fibrillation either by transdifferentiation or vagal denervation by their delivery via the VOM.

Conflict of interest: none declared.

References