**Distribution of adrenergic and cholinergic nerve fibers within intrinsic nerves at the level of the human heart hilum**

**V. Petraitiene1,** D.H. Pauza1, R. Benetis2

1 Institute of Anatomy, Medical Academy, Lithuanian University of Health Sciences, Kaunas, Lithuania

2 Institute of Cardiology, Medical Academy, Lithuanian University of Health Sciences, Kaunas, Lithuania

*Objective:*The aim of the study was to quantitatively evaluate distribution of tyrosine hydroxylase (TH) and choline acetyltransferase (ChAT) positive axons within intrinsic nerves at the level of human heart hilum (HH), since they are fundamental for determining proper treatment options for different arrhythmias.

*Background:*The imbalance between adrenergic (sympathetic) and cholinergic (parasympathetic) cardiac inputs initiates cardiac arrhythmias and sudden cardiac death. Although morphological pattern of epicardial ganglionated subplexuses (ENsubP) was precisely defined previously, the distribution of functionally distinct axons in human intrinsic nerves was unrevealed as yet.

*Methods*:Tissue samples from seven epicardial subplexuses were obtained from nine human hearts without cardiac pathology and processed for TH and ChAT immunofluorescent detection. Nerve area was measured and numbers of axons were counted using nerve microphotographs. Densities of fibers were extrapolated and compared between subplexuses.

*Results:*ChAT**-**immunoreactive (IR) fibers prevailed (>56%) in dorsal (DRA) and ventral right atrial (VRA) ENsubP nerves. TH-IR axons predominated within left (LC) and right coronary (RC) nerves (70.9% and 83.0% respectively). Despite subplexal dependence, ChAT-IR fibers preponderated in thinner nerves, while TH-IR fibers in thicker ones.

Morphometry showed that: (1) LC subplexal nerves were the thickest (25737 ± 4131 μm2), the thinnest (2604 ± 213 μm2) nerves concentrated in DRA ENsubP; (2) density of ChAT-IR axons was the highest (6.8 ± 0.6/100 μm2) in ventral left atrial (VLA), the lowest (3.2 ± 0.1/100 μm2) in left dorsal (LD) nerves; (3) the highest (15.9 ± 2.1/100 μm2) density of TH-IR fibers was in LC, the lowest (4.4 ± 0.3/100 μm2) in VRA nerves.

*Conclusions:*(1) The principal intrinsic adrenergic neural pathways in human heart proceed via coronary ENsubP that supply both ventricles; (2) the majority of cholinergic nerve fibers access human heart through DRA and VRA ENsubP and extend toward right atrium, including the sinuatrial node region.