

Evaluation of Optical Coherence Tomography of the Pulmonary Arteries in Patients with and without Pulmonary Hypertension

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Introduction: To assess severity and prognosis of pulmonary hypertension (PHT), clinical evidence of right-ventricular failure, progression of symptoms, right ventricular function and hemodynamic parameters are taken into account, but predictions remain vague. We evaluated the imaging method of optical coherence tomography (OCT) of the pulmonary arteries for correlation with the severity of PHT in a group of pediatric patients.

Methods: OCT records ("runs") during right heart catheterization were performed with simultaneous angiography to confirm proper positioning of OCT catheter in the peripheral pulmonary arteries. 3 pictures of the best OCT run per patient were chosen to measure inner diameter of the vessel (VD) automatically and the wall-thickness (WT) at three different points manually. Mean VD and mean WT of each patient were correlated with mean pulmonary artery pressure (mPAP), and with pulmonary vascular resistance (PVR) and cardiac output (CO) both absolute and indexed. Wall appearance was studied in terms of layering and appearance of adventitial tissue.

Results: Of 20 Patients, 11 had mPAP 34-88, mean 55 mmHg, the controls had mPAP 8-18, mean 11 mmHg. 62 runs were performed with 1-8 in each patient. VD ranged from 0.88 to 4.87 mm (mean 2.80mm, median 2.58mm); WT ranged from 0.085 to 0.287 mm (mean 0.15mm, median 0.13mm). WT was increased in PH patients (0.18 ± 0.06 mm vs 0.11 ± 0.03 mm, $p=0.011$) and correlated significantly with hemodynamics (mPAP, $r=0.59$; CO, $r=-0.53$; PVR, $r=0.73$ and PVRI, $r=0.70$, all $p=0.009$ or lower). There was a trend that appearance of the wall ('monolayer with an even network of vasa vasorum' versus 'multilayer disrupted by fibrous tissue') correlated with 'no or mild PH' versus 'severe PH'.

Conclusion: Wall thickness and wall appearance of the distal small pulmonary arteries as imaged by OCT in patients with PHT correlates with PHT as such and reflects severity of PHT. Further studies appear to be justified to evaluate if information from OCT can contribute to medical care of children with pulmonary hypertension.