RESPONSE IN CARDIAC LYMPH FLOW AND PROTEIN CONCENTRATION DURING ACUTE ARTERIAL HYPERTENSION

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It is commonly assumed that myocardial compression protects the coronary microvasculature from elevations in arterial pressure. In order to determine the influence of a two hour elevation in arterial pressure on microvascular hydrostatic pressure and macromolecular permeability, cardiac lymph (i.e., flow and protein concentration) were measured at baseline and during arterial hypertension induced by intravenous methoxamine or angiotensin II in 6 anesthetized, opened-chest dogs. To maximize vascular surface exchange area, a balloon tipped catheter placed in the coronary sinus was inflated to keep sinus pressure at 30 mmHg. When baseline mean arterial pressure (118±19 mmHg) was raised by an average of 37 percent, cardiac lymph flow increased by 88 percent. However, lymph protein concentration, measured by protometer, remained invariant. We therefore conclude that an acute drug-induced elevation of arterial pressure leads to increased hydrostatic pressure within the coronary microvasculature and an enhanced efflux of intravascular fluid without an increase in transvascular permeability to plasma protein. Thus, myocardial compression does not protect the coronary microvasculature from acute elevations in arterial pressure.

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Peripheral Vascular Disease

PREDICTIVE VALUE OF TRANSCUTANEOUS OXIMETRY AND AMPUTATION SUCCESS UTILIZING SUPINE AND ELEVATION MEASUREMENTS

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The purpose of our study was to determine the value of transcutaneous oximetry (TcPO2) measurements in predicting amputation site healing and determine the degree of reduction in TcPO2 that could reliably predict healing vs. nonhealing. We performed limb TcPO2 measurements on 75 patients prior to amputation and reviewed their clinical course. TcPO2 measurements were done in both supine position and with leg elevation. In our 75 patients undergoing 90 amputations, there were 52 (57%) that successfully healed, 21 (23%) that failed, and 17 (18%) that exhibited delayed healing. Healed amputations regardless of site had TcPO2 values of 45 torr or greater. We did not observe primary healing in patients with TcPO2 values of less than 30 torr. For patients in our defined borderline zone between 30 and 45, TcPO2 measurements with elevation improved predictability of outcome. A decrease in TcPO2 of less than 10 torr in response to elevation was predictive of successful healing, while a decrease of more than 10 torr was associated with failure.

We conclude that TcPO2 has predictive value for amputation site healing and the addition of TcPO2 with leg elevation substantially improves predictability of amputation outcome in patients with borderline TcPO2 measurements.

TISSUE-SPECIFIC VARIATIONS IN ISOACTIN GENE EXPRESSION IN THE SPONTANEOUSLY HYPERTENSIVE RAT

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The objective of the study is to determine isoactin gene expression in the ventricles and the thoracic and abdominal aorta of spontaneously hypertensive rats (SHR). Experimental groups consist of 8 adult SHR and 8 age-matched control Wistar-Kyoto (WKY) rats. Systolic BP by tail cuff is elevated in the SHR compared to the WKY (162 ± 3 vs. 108 ± 3 mm Hg; mean ± SEM; $p < 0.0005$). SHR also demonstrate left ventricular hypertrophy with a significantly higher LV/body weight ratio than WKY (4.00 ± 0.54 vs. 2.54 ± 0.08 gm/kg; mean ± SD; $p < 0.0005$). The RV free wall/body weight ratio, however, is not different in SHR than in WKY (0.65 ± 0.13 vs. 0.59 ± 0.06 gm/kg; mean ± SD).

Total cellular RNA was isolated for dot blot analysis from LV, RV free wall, and thoracic and abdominal aorta. Oligonucleotide probes were used to identify α-cardiac actin mRNA in the ventricles and α-vascular actin mRNA in the thoracic and abdominal aorta. In SHR ventricles, α-cardiac actin mRNA levels are elevated to the same extent compared to WKY ventricles; levels are 5.0 fold higher in SHR LV and 5.2 fold higher in SHR RV free wall. In contrast, SHR thoracic and abdominal aorta exhibit differences in α-vascular actin gene expression. While α-vascular actin mRNA levels are the same in SHR thoracic aorta as in WKY, these levels are 3.4 fold higher in SHR abdominal aorta.

The results demonstrate that actin isoform gene expression is altered in this genetic model of hypertension and pressure-overload left ventricular hypertrophy. In SHR heart, both ventricles show a similar increase in α-cardiac actin mRNA, whereas in SHR aorta, only the abdominal segment shows a rise in α-vascular actin mRNA. These findings indicate tissue-specific variations in isoactin gene expression.

USEFULNESS AND LIMITATIONS OF INTRAVASCULAR ULTRASOUND IMAGING IN PERIPHERAL ARTERIAL INTERVENTIONAL PROCEDURES.

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Intravascular ultrasound (IVU) devices produce detailed, accurate images of arterial wall and lumen. The clinical usefulness of IVU requires further investigation. In 16 patients (PTS; 9 female) age 66±19 years (range 38-86) IVU imaging was performed during percutaneous transluminal angioplasty (PTA) with thrombectomy (1), atherectomy (2), and laser angioplasty (1). Catheter design limited imaging in 4 PTS. A new over-the-wire catheter design facilitated imaging in 2 PTS. In 12 PTS, 24 lesions were imaged during intervention and analyzed for eccentricity (presence of disease-free wall), calcification and thrombus. IVU demonstrated localized dissections after PTA in 5 of 15 concentric lesions, but only 1 of 9 eccentric lesions. Only 2 of these dissections were demonstrated with angiography. Longer dissections were seen by IVU to penetrate to the media. They persisted after atherectomy (1) or laser treatment (1) but were successfully treated by PTA. During a catheter clot extraction procedure, residual thrombus identified by IVU was treated with urokinase, and the primary atherosclerotic lesion was identified by IVU and treated with PTA. IVU can demonstrate lesion eccentricity and depth and extent of mural dissection, findings not appreciated by angiography which are clinically useful during PTA procedures.