Differential effects of vasodilators on human forearm muscular conduit arteries and resistance vessels

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Actions of vasodilator drugs on human forearm resistance vessels are well characterised. By contrast, little is known about their actions on muscular conduit arteries; these may be important since pulse pressure is influenced by the vascular tone of muscular arteries. Vasodilators that have preferential action on larger arteries may be useful in subjects with isolated systolic hypertension. The aim of this study was to compare effects of the alpha-adrenergic antagonist phentolamine (PHT), the nitrovasodilators nitroglycerin (NTG) and nitroprusside (NP), and hydralazine (HDZ) on the radial artery (muscular conduit artery) and forearm resistance vasculature. Healthy normotensive men aged 19-45 years were studied. The right brachial artery was cannulated using a 27 gauge needle and drugs or saline infused at 1 ml/min. A rising cumulative dose intra-arterial infusion of each vasodilator (PHT, 10, 30 and 100 μg/min, n= 9; NTG 0.03, 0.1, 0.3, 1.0, 3.0 μg/min, n=8, NP, 0.3, 1, 3 μg/min, n=11; HDZ, 10, 30 and 100 μg/min, n=8) was given on separate occasions or after washout. Forearm blood flow (FBF, as a measure of resistance vessel vasodilation) was determined by venous occlusion plethysmography and change in radial artery diameter by high resolution ultrasound. The study was approved by the local research ethics committee and all subjects gave written informed consent. Changes in FBF were expressed as change from baseline (∆FBF) during infusion of saline vehicle. Percent change in diameter was compared for different drugs at doses producing the same ∆FBF. Despite producing similar ∆FBF, PHT produced little increase in diameter. By contrast, there was a significant increase in diameter produced by NTG, NP and HDZ (each p<0.01) with potency NTG>NP>HDZ (figure) and actions of NTG and NP significantly greater than PHT (p<0.01). Thus, within the human forearm, nitrovasodilators are relatively selective dilators of muscular arteries compared to PHT. Relative lack of effect of PHT on muscular arteries may relate to the density of sympathetic innervation of muscular and resistance vasculature. However, other mechanisms are required to explain the differential actions of NTG, NP and HDZ. Classification of the relative specificity of vasodilators using this methodology may help target therapy in relation to the pulsatile and steady components of blood pressure.