
Flow-mediated dilatation revisited

To the Editor: What is new in flow-mediated dilatation (FMD)? Not to characterize precisely the flow stimulus nor to consider the change in basal tone or the flow-mediated release of vasoconstrictors (5, 6). Certainly more that increasing the duration of hyperemia using longer periods of ischemia or hand warming progressively decreases the efficacy of N\(^{\text{G}}\)-mono-methyl-L-arginine (l-NMMA) to abolish FMD (3–5)? This while growing evidence accumulates for a role of endothelium-derived hyperpolarizing factor in the regulation of conduit artery diameter (1, 3). Does it mean that FMD is not a reliable noninvasive estimate of the capacity of human endothelial cell to release nitric oxide (NO)? No, but these experiments suggest a decrease in the relative importance of NO with the duration of hyperemia using longer periods of ischemia or hand warming (5, 6). Certainly more than increasing the duration of hyperemia using longer periods of ischemia or hand warming, the duration of FMD increases progressively decreases the efficacy of N\(^{\text{G}}\)-mono-methyl-L-arginine (l-NMMA) to abolish FMD (3–5)? This while growing evidence accumulates for a role of endothelium-derived hyperpolarizing factor in the regulation of conduit artery diameter (1, 3). Does it mean that FMD is not a reliable noninvasive estimate of the capacity of human endothelial cell to release nitric oxide (NO)? No, but these experiments suggest a decrease in the relative importance of NO with the duration of the flow stimulus, thus inciting us to reserve this interpretation to short durations of stimuli and to persevere in our effort to elucidate the exact mechanisms involved in sustained FMD using higher doses of l-NMMA and/or inhibitors of alternative pathways (3).

In the same way, it cannot be said that coronary artery FMD is NO independent because much evidence has been provided (2). Nevertheless, NO-independent pathways have been identified at this level that could compensate for the decrease in NO availability in relation to cardiovascular risk factors or the presence of atheroma (2).

Furthermore, Tschakovsky and Pyke (3) claim that the shorter hyperemia we reported (5) after local NO synthase inhibition could have fully abolished the radial artery FMD and converted it in vasoconstriction. This is unlikely because such reduced stimuli are associated with lower but significant FMD and correspond to a single displacement along the flow stimulus-FMD relationship toward low values of flow (6). Conversely, the effect we reported reflects the downward shift of the relationship toward negative values of FMD and thus demonstrates the suppression of the vasorelaxant influence of NO at this level after l-NMMA.

In addition, to declare “sympathetic activation can account for blunted FMD in numerous pathologies” appears premature. Indeed, local administration of norepinephrine does not alter FMD despite reducing hyperemia (7). Moreover, duration of hyperemia is decreased in pathologies characterized by elevated sympathetic activity, thus participating in altering FMD (3). Nevertheless, the role of this factor has not been precisely evaluated during sympathetic activation, although it could explain the beneficial effect of phentolamine on the blunted FMD induced by lower body negative pressure (3). Furthermore, in heart failure, physical training restores the radial FMD by increasing NO availability, although sympathetic tone is classically increased in such conditions (4).

In summary, when the flow stimulus and the non-endothelium-dependent relaxation are preserved, a depressed FMD can reasonably be interpreted as an altered endothelial reactivity and, in the defined experimental conditions stated by Green, but also including coronary arteries, this strongly suggests an altered NO reactivity. However, this conclusion must not be dogmatic and lead us to forget that only careful demonstrations performed case by case can have value of proof. This is important and attractive for future research because other endothelium-derived relaxing factors distinct from NO could emerge particularly in pathological states and are probably involved in FMD during sustained flow stimulations.

REFERENCES


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