Time-Courses of Baroreflex Sensitivity, Sympathetic, and Vagal Activities in Response to Mueller Maneuver

Salvador Carrasco-Sosa, Alejandra Guillén-Mandujano

Universidad Autónoma Metropolitana-Iztapalapa, CDMX, México

Despite the clinical and physiological relevance of Mueller maneuver (MM), because it is the opposite respiratory strain of Valsalva maneuver, mimics obstructive sleep apnea effects, and is a therapeutic procedure used in cardiovascular diseases, its effects on the time-courses of baroreflex sensitivity (BRS), sympathetic and vagal activities have not been reported. Thus, we assessed, in 37 recordings of healthy volunteers, the effects provoked by MM (-40 mmHg, 20s) on the time-courses, estimated by a time-frequency distribution, of low-frequency components of RR (LF_{RR}), systolic (LF_{SBP}) and diastolic blood pressure (LF_{DBP}); high-frequency component of RR (HF_{RR}), BRS, computed by alpha index ($\sqrt{(LF_{RR}/LF_{SBP})}$) and its coherence ($BRS_{CO}$), obtained by cross time-frequency analysis.

Ensemble averages of the indexes dynamics, relative to their control values, showed: increments of systolic (SBP) and diastolic blood pressure (DBP) -both after dropping in early phase II (II_E)-, LF_{SBP} and LF_{DBP} in late phase II (II_L) with a plateau that persists until early phase IV (IV_E), and gradual recovery in late phase IV (IV_L); decrement of RR in phases II_E, II_L and IV_E, and increment in IV_L; reductions of BRS (Table) and HF_{RR} in phases II_E and II_L, followed by increments to a maximum in IV_L; increment of LF_{RR}/HF_{RR} ratio in II_E and II_L and reduction in IV_L (Table). In each phase, BRS_{CO} was greater than 0.71 and most indexes' means were different ($p<0.03$) from their baseline.

Our findings support that MM elicits, via baroreflex with reduced sensitivity, increments of cardiac and vasomotor sympathetic outflow and reduction of vagal activity in the strain, effects that provoke rise of SBP, DBP, and cardioacceleration, and, in the post-strain, greater elevations of SBP and DBP that, via baroreflex, now with augmented gain, cause gradual reduction of cardiac and vasomotor sympathetic activities and increment of vagal activity, leading to cardiodeceleration and arterial pressure recovery.

Table. Mean±SD of BRS and LF_{RR}/HF_{RR} in phases II_E, II_L, IV. N=37.

	Control	Phase II_E	Phase II_L	Phase IV
BRS (ms/mmHg)	11.4±3.9	6.9±2.3*	7.5±3.7*	15.7±5.7*
LF_{RR}/HF_{RR}	0.70±0.37	1.05±0.49*	0.93±0.55*	0.53±0.31*

*$p<0.006$ vs. mean control value