Power spectral analysis of systemic arterial pressure signals during open heart surgery.

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摘要

Abstract

BACKGROUND: The close relationship between the balance of sympathetic and parasympathetic tones and the results of power spectral analysis (PSA) of systemic arterial pressure (SAP) has been suggested recently. The purpose of this study was to further describe the changes of balance between the two autonomic nervous components during open heart surgery for coronary arterial disease (CAD) or valvular heart disease (VHD) with the PSA technique of SAP. METHODS: By relaying the SAP signals to a personal computer utilizing a power spectral analysis algorithm, radial arterial pressure signals of 27 patients (11 with CAD for coronary artrial bypass graft, as CAD groups; 16 with VHD, as VHD group, including 8 for aortic valve replacement and 8 for mitral valve replacement) during open heart surgery were monitored in a continuous, on-line and real-time manner. On-line power spectral analysis was performed according to the five different stages of the operation. RESULTS: Power density tended to increase in the high frequency (HF) band during the ventilator-supported stages of the open heart procedures, i.e., the pre-cardiopulmonary bypass (CPB) and the off-CPB periods. The power density in other frequency bands during the whole course of general anesthesia otherwise decreased significantly, with the lowest values occurring during CPB. The power density in very low frequency (VLF) band was much higher than in other bands during CPB, and became the major component of total power density in this period. CONCLUSIONS: The balance between sympathetic and parasympathetic components of autonomic nervous system changes rapidly during open heart surgery and needs careful monitoring. By utilizing PSA of SAP, mathematical error might be an obstacle of using LF:HF ratio as an index of autonomic balance during the CPB period when the HF density approaches zero.