Effect of sinoaortic denervation on baroreflex sensitivity assessed with complex demodulation in the anaesthetised rat

Y.C. Tzeng, P.D. Larsen and D.C. Galletly, Department of Surgery and Anaesthesia, Wellington School of Medicine, PO Box 7343, Wellington, New Zealand.

The relevance of baroreflex dysfunction in the clinical setting has simulated a rapidly expanding area of research into the assessment of baroreflex sensitivity (BRS). Recent efforts have concentrated on developing non-invasive techniques that allow BRS to be determined from spontaneous heart rate and blood pressure recordings, such as the sequence method and the α-index. However, these techniques are limited as they provide average estimates over the entire period of recorded data. More recently, Kim & Euler (1997) introduced an alternative method of estimating BRS from spontaneous heart rate and blood pressure fluctuations based on complex demodulation (CMD) that is capable of assessing the dynamic changes in cardiovascular variability and baroreflex sensitivity as a function of time (Hayano *et al*. 1993). Using an anaesthetised rat model, the current study was conducted to validate the use of CMD analysis in sinoaortic denervated rats, and compare its performance to the Oxford method, sequence technique and α-index.

In 12 anaesthetised rats breathing isoflurane (1.5-2%) through a tracheal cannula, we recorded the ECG and continuous arterial blood pressure before and after sinoaortic denervation (SAD). Arterial baroreflex testing using the Oxford method was performed before and after SAD using similar doses of phenylephrine (1.5 μg kg^{-1}) and sodium nitroprusside (2.5 μg kg^{-1}) in 0.3 ml over 15 s administered intravenously. From spontaneous HR and SBP recordings we determined non-invasive BRS using CMD, sequence technique and the α-index.

Consistent with Kim & Euler's study, we found that BRS values obtained with CMD was strongly correlated to values derived from phenylephrine ($R=0.83$, $P<0.01$), nitroprusside ($R=0.77$, $P<0.01$), sequence technique ($R=0.85$, $P<0.01$) and α-index ($R=0.78$, $P<0.01$). The absolute values of BRS estimates obtained with CMD was similar to sequence technique and α-index, but where significantly greater than values obtained with the Oxford method. Following SAD, Oxford measures of BRS decreased to almost 0, while CMD and sequence techniques showed 50% reductions. The α-index method showed no significant decrease following SAD.

We conclude that the CMD approach to measuring BRS is at least as accurate as the sequence technique and is superior to the α-index. All three non-invasive measures differ markedly from the Oxford measure. The fine temporal resolution offered by CMD, and the high correlation with the Oxford method mean that this technique would be very useful as an index of BRS under conditions in which BRS is changing rapidly, and invasive measures are not possible.

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