

CORRESPONDENCE

such that, after proper insertion of the connector, movement of the power cord will not affect the integrity of the connector to the receptacle connection. Further, Ohmeda believes that performing a preoperative checkout procedure that includes a physical inspection of the equipment, such as found in the operating and maintenance manual for the Ohmeda anesthesia systems or available from the FDAs, will help identify this condition.

For additional information, please contact the local Ohmeda representative or contact Ohmeda, in Madison, Wisconsin, at 608-221-1551.

Graham B. Lukey
Quality Engineering Manager
Ohmeda Inc.
Ohmeda Drive
P. O. Box 7550
Madison, Wisconsin 53707-7550

(Accepted for publication January 23, 1995.)

Anesthesiology
82:1301, 1995
© 1995 American Society of Anesthesiologists, Inc.
J. B. Lippincott Company, Philadelphia

Separation of the Oscillometric Calibration from the Arterial Tonometer Signal

To the Editor:—We agree with Siegel *et al.*¹ that, in the noninvasive blood pressure measurement device they evaluated, it is important to assess independently the agreement with the reference measurements of the calibration and the tonometer.

However, we do not agree with the procedure the authors use to “determine the extent to which the lack of agreement between [arterial tonometry] and [intraarterial measurements] is attributable to the oscillometric calibration and the extent to which it is attributable to the piezoresistive crystal array measurement.” To explain our disagreement, it is necessary to discuss the calibration of the tonometer signal. The operator’s manual of the NCAT N-500 states, “Absolute intra-arterial pressure is not measured precisely by the sensor transducer. However, the monitor measures relative intra-arterial pulse amplitude with high accuracy.” This implies that the oscillometric blood pressure measurement must provide a gain factor and an offset to calibrate the tonometer signal. The gain factor brings the uncalibrated tonometer signal amplitude to the calibrated amplitude by multiplication. After that, the offset brings the signal to the calibrated level by addition. The authors only mention the use by the NCAT of the mean oscillometric blood pressure to offset the tonometer signal, not the necessity of using at least a second oscillometric blood pressure measurement value to calculate the gain factor. The consequence of this is that the measure the authors use for calibration error, namely the difference between the mean intraarterial pressure during oscillometric blood pressure measurement and the mean oscillometric blood pressure measurement, is not correct.

Separation of the oscillometric calibration from the tonometer signal to establish the lack of agreement between the tonometer measurement and the intraarterial measurement means that the oscillometric calibrated tonometer signal must be recalibrated against the intraarterial blood pressure measurement. Correct recalibration is achieved by calculating a gain factor and an offset that transforms

the oscillometric calibrated tonometric signal into the intraarterial calibrated tonometric signal in the same way we describe for the uncalibrated tonometer signal. The difference between the intraarterial calibrated tonometer signal and the intraarterial signal describes the lack of agreement attributable to the tonometer measurement. The difference between the oscillometric calibrated tonometer signal and the intraarterial calibrated tonometer signal describes the lack of agreement attributable to the total calibration process. This calibration process consists of the oscillometric calibration measurement plus the application of this measurement by the device’s calibration algorithms.

The method used by the authors to eliminate oscillometric calibration error is only valid in the special case of constant blood pressure during the comparison period. Any blood pressure change during the comparison period will render their method invalid. In conclusion, the method of comparison used by the authors, namely calculating and comparing mean blood pressures, does not allow correct discrimination between lack of agreement due to oscillometric calibration and lack of agreement caused by tonometer measurement.

Jan R. de Jong, M.D.
Henk H. Ros, Ph.D.
Jaap J. de Lange, Ph.D., M.D.
Free University Hospital
Department of Anaesthesiology
P. O. Box 7057
1007 MB Amsterdam
The Netherlands

Reference

1. Siegel LC, Brock-Utne JG, Brodsky JB: Comparison of arterial tonometry with radial artery catheter measurements of blood pressure in anesthetized patients. *ANESTHESIOLOGY* 81:578-584, 1994

(Accepted for publication January 23, 1995.)

* Operator’s manual: N-CAT continuous noninvasive blood pressure monitor model N-500. Nellcor Inc., 1991, p. 5.