TITLE: RESPIRATORY SINUS ARRHYTHMIA ANALYSIS DURING SPINAL ANESTHESIA: EVALUATION OF VAGAL TONE IN RELATION TO ANESTHETIC LEVEL

AUTHORS: J. Baeuerle, M.D., D. Fox, M.D., E. Menk, M.D., C. Kingsley, M.D., J.A. Dellinger, Ph.D
AFFILIATION: Anesthesia Service, Brooke Army Medical Center, and Southwest Research Institute, San Antonio, Texas

Introduction. Spinal anesthesia (SAB), in addition to achieving sensory blockade to dermatomal segments, also blocks the sympathetic nervous system (SNS). The degree of SNS blockade is assessed clinically by determining the level of sensory anesthesia and by observing bradycardia and hypotension. Reduction of SNS tone may result in vagal or parasympathetic predominance. Computerized respiratory sinus arrhythmia (RSA) analysis has been shown to be indicative of vagal tone (VT). RSA analysis during isoflurane-nitrous oxide anesthesia has shown a decrease in VT.[1] This study investigated the relationship between VT, as determined by RSA analysis, and dermatomal level of spinal anesthesia.

Methods. With Institutional approval and informed consent, 34 ASA I and II patients undergoing SAB for non-emergent surgery were studied. The drug used and its dosage were determined by the anesthesia care provider. Routine monitors included pulse oximetry, BP with Dinamap[R], and ECG. Baseline and intra-operative ECG data was stored on a 12-channel reel to reel tape recorder. Baseline ECG and vital signs were recorded prior to and every 5 minutes after onset of SAB, along with anesthetic level achieved. Eight patients received hyberbaric lidocaine (LID), while 13 patients received hyperbaric bupivicaine (BUP) and 13 patients received hyperbaric tetracaine (TET). The vagal tone monitor analyzed the R-R intervals from the ECG every 30 seconds throughout the procedure and determined HR and an estimate of VT.[1] In all cases the highest analgesic level to pin prick occurred by 25 minutes. Baseline VT and VT at highest analgesic level were compared. All values were expressed as mean ± SD. Statistical analysis consisted of one-way analysis of variance and Student's t-test.

Results. With $p<0.05$ regarded as significant, the mean VT prior to placement of SAB was 4.7 while the mean VT after highest anesthetic level was 4.8. Five LID patients had an increase in VT while three had a decrease. An equal number of BUP patients (six each) had an increase or decrease in VT, while one patient had no change. Eight TET patients had an increase in VT while four had a decrease and one patient had no change. There was no correlation between levels of analgesia or occurrence of hypotension, and change in VT from baseline. The direction of VT change was not predictive.

Discussion. VT, as determined by RSA analysis, does not appear to change significantly with sensory levels during SAB.

Reference: Anesth Analg, 64:811, 1985.

A511

Title: COMPARISON OF CARDIAC OUTPUTS MEASURED BY TRANSTRACHEAL DOPPLER AND THERMODILUTION IN ANESTHETIZED PATIENTS

Authors: S Saeki M.D., T Namba M.D., Y Nakayama M.D. H Tokioka M.D., K Morita M.D., F Kosaka M.D.
Affiliation: Department of Anesthesiology & Resuscitology, University of Okayama Medical School, Okayama 700, Japan

Recently, a Doppler ultrasound probe is incorporated into an endotracheal tube (ABCOM®, Applied Biometrics). Cardiac output(CO) measured by this transtracheal Doppler method(TCO) is shown to correlate with CO measured by thermodilution method(TDCO)[1]. But correlation of TCO to TDCO measured in each patient is not evaluated. Because it is clinically important whether or not the two CO correlate in each patient, we measured both TCO and TDCO sequentially in each patient and evaluated the correlation of TCO to TDCO.

The transtracheal Doppler probe was inserted in 8 consenting patients undergoing general surgery, who required pulmonary artery catheterization as part of their routine intraoperative monitoring. They did not have any aortic valve diseases or chronic rhythm disturbances. The position of Doppler probe was adjusted by translating it along its longitudinal axis and rotating the patient's head to maximize both audio and visual representation of forward flow as determined by Doppler shift[1]. TCO was monitored continuously. TDCO was measured with 7F Swan-Ganz catheter(American Edwards), when a large change in TCO was observed. In each patient, correlation of TCO to TDCO was assessed by least squares linear regression method. P-values less than 0.05 were considered significant.

In each case TCO showed good correlation with TDCO (Table). But CO measured by the transtracheal Doppler method was underestimated in patient #8, in whom preoperative chest X-ray examination showed the ascending aorta running caudally with respect to the tracheal bifurcation. Because ABCOM uses fixed value for the angle of the ultrasound beam to the blood velocity vector[1], the anatomical variation between the trachea and the ascending aorta may have caused the dissociation of TCO and TDCO in case 8. In conclusion, the transtracheal Doppler allowed continuous CO monitoring in an anesthetized intubated patient.

Reference
1. JH Abrams, RE Weber and KD Holmen: Continuous Cardiac Output Determination Using Transtracheal Doppler: Initial Results in Humans. ANESTHESIOLOGY 71: 11-15, 1989

Table

case 1:	n=7	TCO=1.00xTDCO+0.03	r=0.986	p<0.001
case 2:	n=12	TCO=0.96xTDCO+0.39	r=0.974	p<0.001
case 3:	n=12	TCO=1.01xTDCO-0.26	r=0.940	p<0.001
case 4:	n=12	TCO=0.70xTDCO+0.90	r=0.928	p<0.001
case 5:	n=15	TCO=1.27xTDCO-0.95	r=0.921	p<0.001
case 6:	n=9	TCO=0.92xTDCO+0.76	r=0.835	p<0.01
case 7:	n=11	TCO=0.93xTDCO+0.44	r=0.752	p<0.01
case 8:	n=8	TCO=0.87xTDCO-1.59	r=0.818	p<0.05

(n:no. of the observation, r:correlation coefficient)