

Title: INCREASED INTRAOPERATIVE CARDIOVASCULAR MORBIDITY IN DIABETICS WITH AUTONOMIC NEUROPATHY

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Introduction. There have been several reports of bradycardia and hypotension as well as cardio-respiratory arrest during the perioperative period in diabetic patients.^{1,2,3} Some of these patients were later evaluated for, and found to have autonomic neuropathy. We sought to determine if preoperative screening for autonomic neuropathy in diabetic patients could predict intra or post-operative cardiovascular instability.

Methods. In a prospective study approved by the Institutional Human Research Review Committee, consenting diabetics (N=15) and non-diabetic controls (N=21) were tested for autonomic neuropathy prior to elective eye surgery. Following routine preoperative evaluation, non-invasive autonomic screening tests were performed. These tests consisted of (1) average heart rate (HR) and blood pressure (BP) responses to 5 min 65° head-up tilt, (2) the standard deviation of 100 consecutive R-R intervals during quiet and forceful respiration (SD-RR), (3) the HR ratio phase (IV ÷ III) of Valsalva's maneuver (15 sec., 40 mmHg strain with open glottis) and (4) peak BP responses to the cold pressor test (hand in ice water for 1 minute).

The anesthetic technique was standardized and consisted of premedication with oral diazepam (5-10 mg) and IV glycopyrrolate (0.2 mg). Patients were induced with fentanyl (1-2 µg/kg) and thiopental (3-4 mg/kg) and vecuronium (0.1 mg/kg). Anesthesia was maintained with isoflurane/N₂O/O₂. The EKG was monitored continuously and BP was determined by an automatic oscillometric unit with print out. BP readings were obtained every 2 min. before induction, every 1 min. during induction until 10 min. after intubation and every 5 min. thereafter. Data were analyzed with unpaired t-tests and ANOVA.

Results. Diabetic and control patients were of comparable age. Thirteen diabetics had been receiving insulin therapy for more than 15 yrs, none had renal disease. Three diabetics and 2 controls were treated hypertensives, none were taking cardiac beta blockers or central sympatholytic agents. Fourteen diabetics and 17 controls had retinopathy.

The SD-RR during forceful respiration and the Valsalva ratio are tests primarily of cardiac vagal function while the changes in diastolic blood pressure (ΔDBP) during tilt and cold pressor testing are responses mediated primarily by sympathetic efferent vasoconstrictor impulses. The autonomic test results (Table 1) demonstrate the presence of significant autonomic dysfunction among the diabetics. Heart rate and BP declined to a greater degree during induction of anesthesia in diabetics compared to controls and there was less of an increase in the same parameters following intubation in the diabetic patients (Table II). Thirty-three percent (5/15) of the diabetics required intraoperative vasopressors compared to only 4.3% (1/21) control patients with-

out autonomic neuropathy. A major finding was the significant observation that 4 of the 5 diabetics who required intraoperative BP support had the most deficient autonomic test results. There were no postoperative complications amongst groups.

Table 1. Autonomic Test Results

	Baseline HR(b/min)	SD-RR MAP(mmHg)	Valsalva msec IV/III	Δ DBP, mmHg Tilt	Cold
C	64±3	87±2	79±13	1.6±0.1	2.5±1
D	72±3*	96±3*	32±8**	1.2±0.1**	-1.8±2* 8±2*

Data are mean±SEM. C vs. D *P<.05 **P<.01
C = controls, D = diabetics

Table 2. Peak Δ response from preinduction baseline

	Induction ΔHR(b/min)	ΔMAP(mmHg)	Intubation ΔHR	ΔMAP
Controls	-3±3	-19±3	14±4	24±4
Diabetics	-7±3	-32±3*	8±8	8±5*

Data are mean±SEM. Control vs. Diabetic, *P<.05

Discussion. Vagal and sympathetic neuropathy are known to occur in diabetes and this could result in an impaired ability of diabetics to maintain cardiovascular stability during anesthesia and surgery.^{1,2,3} In this study, preoperative evaluation of cardiac autonomic function clearly differentiated the diabetics from the non-diabetic control group. Diabetics demonstrated more lability of HR and BP during induction and maintenance of anesthesia than control patients. The majority of diabetics with intraoperative morbidity were those with the most profound autonomic dysfunction in the preoperative testing. Our data suggest that simple non-invasive preoperative autonomic testing may be useful in identifying diabetic patients at high risk for intraoperative cardiovascular instability.

References.

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