

Title : HEMODYNAMIC PREDICTORS OF MYOCARDIAL ISCHEMIA IN PATIENTS UNDERGOING AORTIC VASCULAR SURGERY : AT LAST WE CAN MEASURE THEM !

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#### INTRODUCTION.

The prevention of myocardial ischemia during aortic vascular surgery is of prime importance since the deleterious effects of this complication have been well documented. Previous studies have looked at intraoperative myocardial ischemia in a subjective way, without the possibility of retrospectively considering both hemodynamics and ST segment changes that were simultaneously recorded. Thus, hemodynamic predictors for such episodes have not been well defined. Further, if in cardiac surgery, a high percentage of myocardial ischemia is accompanied by NO hemodynamic changes, this question has not been studied in the general surgery setting.

To clarify this issue, we undertook a study in patients undergoing aortic vascular surgery with the novel method of gathering simultaneously hemodynamic as well as ST segment changes every 3 seconds, during the intraoperative period. We had thus, the opportunity to retrospectively, analyze the data and look for hemodynamic predictors of myocardial ischemia in this group of patients.

#### METHODS.

Nineteen patients scheduled for aortic vascular surgery were included in our study. After IM premedication (morphine 5 mgs and scopolamine 0.5 mgs), radial and pulmonary artery catheters were placed. Anesthesia was induced with fentanyl, a benzodiazepine and pancuronium. Maintenance was with 50 % N<sub>2</sub>O in O<sub>2</sub> and isoflurane. The latter was used in increments of up to 4 % to control intraoperative episodes of hypertension.

EKG monitoring was done with a Marquette Electronics series 7000 scope which allowed us to look at the ST segment in three different leads simultaneously (I, II, V). This monitor further afforded us the opportunity to measure ST changes, in tenths of a millimeter from a reference tracing, along with all of the hemodynamic variables. Criteria for definition of an ischemic ST segment change were : 1) horizontal ST depression > 1 mm ; 2) in the case of a downsloping ST, J-Point depression > 1 mm ; 3) in the case of an upsloping ST, a point 0.08 seconds from the J-Point had to be > 2 mm ; 4) ST elevation > 2 mm.

All hemodynamic variables and EKG data were recorded simultaneously. The monitor was polled every 3 seconds with the aid of specialized software developed for this purpose (HMP SENSOR), and data was stored at the end of each case on the hard disk of the IBM PS2 8580 we used.

Hemodynamic predictors were defined by comparing mean values over a 15 minute period before, and 5 minutes after an ischemic ST segment change. If a patient suffered from several ischemic episodes, only the first event was taken into account since the hemodynamics preceding the following one, might be influenced by an already stunned heart.

#### RESULTS.

Nine out of the 19 patients studied had an intraoperative ischemic episode. Of these 9, 8 corresponded to changes in lead V5 (6 downsloping and 2 upsloping), and 1 in lead II (downsloping). A significant hemodynamic change preceded ALL ischemic episodes seen in our group. In 3 patients, ischemia was preceded by a net increase (> 40 %) in systolic blood pressure (SBP), associated with an increase in heart rate (HR) in 1 of these cases. The other 6 patients had a decrease in SBP of at least 25 %. In all of these 6 patients the ratio of MAP/HR which was > 1 ( $1.4 \pm 0.3 \times \pm SD$ ), one minute before the ischemic episode, became < 1 ( $0.77 \pm 0.16$ ), the minute preceding the ST segment changes.

#### DISCUSSION.

A computer system with specialized software which gathers, every 3 seconds, all hemodynamic variables simultaneously with ST segment changes, enabled us to show the high incidence of myocardial ischemia (9/19), in patients undergoing aortic vascular surgery with a traditional anesthetic protocol. By contrast to studies performed in cardiac surgery, all the ischemic episodes observed in our series of vascular surgical patients were preceded by significant hemodynamic changes.

One third of the ischemic episodes seen, occurred in the setting of an increased MV0<sub>2</sub>, while two-thirds were secondary to a decrease in O<sub>2</sub> supply.

In this latter group, the index (MAP/HR) pointed out by Buffington (2) as a predictor of ischemia in an experimental study, seems to be a good predictor for this complication in this clinical setting.

#### REFERENCES

1. SLOGOFF S., KEATS AS. : Does perioperative myocardial ischemia lead to postoperative myocardial infarction ? ANESTHESIOLOGY 62 : 107-114, 1985
2. BUFFINGTON CW. : Hemodynamic determinants of ischemic myocardial dysfunction in the presence of coronary stenosis in dogs. ANESTHESIOLOGY 63 : 651-662, 1985.