

Title : CENTRAL HEMODYNAMIC CHANGES DURING AORTIC RECONSTRUCTIVE SURGERY - EFFECTS OF ADRENERGIC BLOCKADE AND TEMPORARY SHUNT

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Introduction. Major circulatory changes do occur during aortic reconstructive surgery and is a threat to the elderly patients with concomitant cardiac disease. The crisis points are considered to be the aortic clamping and declamping procedures. To obtain a stable central circulation it is essential to differentiate the type of anesthesia and the peroperative fluid administration as well as in suitable cases add vasodilating drugs and temporary shunts during the aortic clamping.

Methods. 33 patients (age 39-79) were operated on because of occlusive aortic disease (OAD) with developed collaterals (18) or abdominal aortic aneurysm (AAA) with normal peripheral circulation (15). All operations included clamping of the intra-renal aorta and reconstruction with a bifurcation graft. Morphine (2 mg/kg b.w.) and Droperidol (10-15 mg) was used for anesthesia with volume-controlled ventilator (N₂O/O₂; FiO₂ 0.35). Fluids were administered to give an urine output of 1 ml/kg b.w./hour i.e. around 400 ml 5.5% glucose/h. Blood losses were replaced unit for unit. During clamping 5% albumin and Ringer's solutions were administered to gradually increase the pulmonary artery wedge pressure (PCW) to 10-15 mm Hg immediately before declamping.

Group I: 6 patients (3 AAA + 3 OAD) received no special pre- or peroperative treatment.

Group II: 15 patients (OAD) received a β_1 -receptor blocking agent (metoprolol, 200 mg daily for 3-5 days preoperatively) and an α -receptor blocking agent (phenoxybenzamine 1 mg/kg b.w. in 5.5% glucose i.v. the preoperative night).

Group III: 6 patients (AAA) received the same preoperative adrenergic blockade as group II.

Group IV: 6 patients (AAA) received in addition to the adrenergic blockade a temporary axillo-femoro-femoral by-pass during the clamping period.

Heart rate, intraarterial blood pressure, CVP, pulmonary artery pressure, PCW, cardiac output and diuresis were monitored. Measurements were performed before aortic clamping, during the clamping, 3-5 min and 30 min after the aortic declamping. Statistical evaluation of the results within the groups was made using Student's T-test for paired observations, and unpaired test comparing the different groups. P 0.05 was considered significant. This study was approved by the Ethical Committee of the Medical Faculty, University of Lund.

Results. Cardiac index (CI) l/min/m² - before clamping CI in group I was significantly lower than in groups II-IV. There was no difference between these groups. Following aortic declamping CI increased significantly in all groups.

Mean arterial pressure (MAP) mm Hg - was constant during the operative procedure. Group I had a significantly elevated MAP level (fig).

Left ventricular stroke work (LVSW) g.m. - was unaffected by the clamping and declamping in group II - IV. In group I declamping provoked a significant increase of LVSW (fig).

Systemic vascular resistance (SVR) dynes · sec · cm⁻⁵ - was unaffected by the aortic clamping in all groups. In groups I and II a significant decrease was noted after aortic declamping. In group IV there were no changes (fig).

Oxygen consumption $\dot{V}O_2$, ml/min - remained unchanged in all groups but increased significantly 3-5 min after declamping in groups I, III and IV. 30 min after declamping there was a further significant increase in group I.

Discussion. The increase in CI observed after declamping was mainly due to an increased stroke volume except in patients with a temporary shunt where heart rate increased due to an insufficient β_1 -blockade. In patients without adrenergic blockade the high CI provoked a myocardial stress depicted by a high LVSW and $\dot{V}O_2$. These patients also showed ventricular arrhythmias. The lower LVSW in patients with adrenergic blockade and temporary shunt was due to the generally lower SVR. Patients where the ischemia was incomplete due to developed or "artificial" collaterals had the lowest SVR and thus the lowest LVSW. The increased $\dot{V}O_2$ in these patients was probably more due to an increased oxygen demand following restoration of leg blood flow than to myocardial oxygen requirement. MAP was in general considerably higher in the unblocked patients. Most likely myocardial disorders are considerably lessened when surgery is carried out under controlled moderate hypotension. We think that a general peroperative adrenergic blockade is favourable during aortic reconstructive surgery most of all because of the decreased "afterload". A temporary shunt may be considered in "poor risk" patients operated for AAA with normal peripheral circulation where adrenergic blockade alone might be insufficient.

