Title: SYSTEMIC HEMODYNAMIC EFFECTS OF DELIBERATE HYPOTENSION WITH NICARDIPINE OR SODIUM NITROPRUSSIDE DURING TOTAL HIP ARTHROPLASTY

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Introduction. Sodium nitroprusside (SNP) is the reference pharmacological agent for controlled hypotension, but its side effects (toxicity, tachyphylaxis, and rebound hypotension) suggest that new research protocols are required. The literature provides little information about the use of calcium channel blockers to produce hypotension despite their well-known vasodilator effects. Among dihydropyridine derivatives, nicardipine (N) is of special interest because (i) it is light-stable in solution, (ii) it may be used by continuous infusion, and (iii) it functions as a systemic arteriolar vasodilator and does not demonstrate cardiodepression in clinical situations. This investigation was designed to compare N with SNP in producing controlled hypotension during total hip arthroplasty.

Methods. The study was approved by our local ethics committee, and informed consent was given by 20 ASA I or II patients aged between 51 and 78 yr. After diazepam (15 mg po), heart rate (HR), mean arterial pressure (MAP; radial artery cannula), right atrial (RAP) and pulmonary capillary wedge (PCWP) pressures, and cardiac output (CO; 7.5 Fr thermodilution Swan Ganz catheter) were monitored. Derived values were calculated in the usual manner: cardiac index (CI), stroke index, and systemic vascular resistance index (SVRI). Patients were anesthetized with thiopental (5 mg/kg) and fentanyl (5 µg/kg), intubated after vecuronium injection (0.1 mg/kg) and ventilated with N₂O in O₂ (FIO₂=0.5; PaCO₂ 4.2-5.2 kPa). Supplemental doses of fentanyl and vecuronium were given during the operation. Patients were randomly assigned to 2 groups for deliberate hypotension: N (n=10) or SNP (n=10). Hypotension was initiated before skin incision with N (20 mg in 20 ml of 5% dextrose in water; 10 µg/kg/min as loading dose) or with SNP (5 mg in 50 ml of 5% dextrose in water; 1 µg/kg/min). Infusions were then regulated to achieve the desired hypotension (MAP = 50-60 mmHg), and discontinued before the first cementing. Data were collected during anesthesia with the patient in lateral position, before hypotension (before), during hypotension (when the desired level was achieved =load), and after 10 min, after 20 min, and after 60 min. Fluid replacement was with colloids (polygeline). Results are expressed as mean±SD. ANOVA, paired and non-paired t tests with Bonferroni correction were used for statistical analysis. P < 0.05 was considered as significant.

Results. No difference was observed between groups with regard to age, weight, intraoperative blood loss (320±140 ml with N vs 310±80 ml with SNP), or duration of administration of vasodilators (9±14 min with N vs 92±17 min with SNP). The loading dose of N was 4.1±2.4 mg. The modulation of the level of MAP was easy to obtain. The maintenance dosage was 2.9±1.3 µg/kg/min for N and 2.2±1.2 µg/kg/min for SNP. The main hemodynamic results are summarized in the table. In both groups RAP, PCWP, and HR were unmodified. No bradycardia and no effects on the cardiac conduction system were observed.

Discussion. Nicardipine was as potent, precise, and easy to control as was SNP for deliberate hypotension. Hemodynamic profiles were similar for both agents: no myocardial depression, marked vasodilation, increased CI. However, nicardipine may be advantageous in clinical practice because hemodynamic stability was better preserved with N than with SNP in the posthypotensive period. No rebound hypotension was observed on withdrawal in contrast to SNP, and MAP returned gradually to baseline values before closing of superficial layers.

References.