Managing Hypertension in the Perioperative Arena

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Optimizing Perioperative Management Strategies for Hypertension in the Cardiac Surgical Patient

Objectives:
- Treatment of hypertensive emergencies.
- Precise control of arterial pressure.
  - Avoid end-organ hypoperfusion.
- Minimize the adverse effects of therapy.
  - Hypotension
  - Adverse drug reactions


<table>
<thead>
<tr>
<th>SBP</th>
<th>DBP</th>
<th>Recommendations</th>
</tr>
</thead>
<tbody>
<tr>
<td>140-159</td>
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JNC 7: Prevention, Detection, Evaluation, and Treatment of High Blood Pressure, May 2003

Hypertensive Urgencies and Emergencies
Patients with marked BP elevations and acute target-organ damage
- Life-threatening Arterial Bleeding
- Aortic Dissection or Aneurysm
- Myocardial Infarction
- Unstable Angina
- Pulmonary Edema
- Encephalopathy
- Stroke
- Head Trauma
- Eclampsia

III. Disease-Specific Approaches: Hypertension

Class | SBP | DBP | Recommendation
<table>
<thead>
<tr>
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<tr>
<td>Stage 1</td>
<td>140-159</td>
<td>85-99</td>
<td>Not an independent risk</td>
</tr>
<tr>
<td>Stage 2</td>
<td>160-179</td>
<td>100-109</td>
<td>Not an independent risk</td>
</tr>
<tr>
<td>Stage 3</td>
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Risks of General Anesthesia and Elective Operation in the Hypertensive Patient
Lee Solomon, M.D. and Dora C. Catena, M.D.

To determine the effect of general anesthesia and electrocautery on arterial blood pressure in patients who were found to be hypertensive, the author prospectively studied 186 consecutive patients in a series of prospective studies. All patients were treated preoperatively with metoprolol, hydralazine, and phentolamine, or an equivalent combination of agents. Arterial blood pressure was measured with an cuff sphygmomanometer 1 minute after induction of anesthesia. No significant differences in arterial pressure were noted between the hypertensive and normotensive groups. The lowest tolerated blood pressure was greater in hypertensives (170 ± 10 mm Hg) than in normotensives (150 ± 10 mm Hg). Thus, a combination of electrocautery and general anesthesia is safe for the hypertensive patient. However, the results of this study suggest that in patients with untreated hypertension, the use of electrocautery should be limited.
Approach to Elevated Blood Pressure in Acute Ischemic Stroke

A. Not Eligible for Thrombolytic Therapy
- SBP<220 or DBP<120: No treatment
- SBP>220 or DBP>121: 10-15% reduction in BP
- DBP > 140: 10-15% reduction in BP

B. Eligible for Thrombolytic therapy
- SBP>185 or DBP>110: Achieve SBP 185 and DBP 110

Guidelines for the Early Management of Patients with Ischemic Stroke

Antihypertensive Agents and Acute Coronary Syndromes

EFFECT OF SHORT-TERM INFUSION OF GEMIUNI NITROPRUSSIODE ON MORTALITY RATES IN ACUTE MYOCARDIAL INFARCTION COMPARETED BY LEFT VENTRICULAR FAILURE

Results of a Veterans Administration Cooperative Study


Elective CABG

<table>
<thead>
<tr>
<th>LOW MAP during CPB (50-60 mm Hg)</th>
<th>HIGH MAP during CPB (80-100 mm Hg)</th>
</tr>
</thead>
<tbody>
<tr>
<td>n=124</td>
<td>n=124</td>
</tr>
<tr>
<td>12.9% Combined Cardiac and Neurologic Morbidity</td>
<td>4.8% p=0.026</td>
</tr>
<tr>
<td>4.0% Mortality (6 months)</td>
<td>1.8% p=0.25</td>
</tr>
<tr>
<td>3.2% Stroke Rate (6 months)</td>
<td>2.4% p=0.076</td>
</tr>
<tr>
<td>4.8% Cardiac Complications (6 months)</td>
<td>2.4% p=0.3</td>
</tr>
<tr>
<td>12% Significant Cognitive Decline</td>
<td>11% n.s.</td>
</tr>
<tr>
<td>6.3% Degree of Improvement in Functional Status</td>
<td>6.5% n.s.</td>
</tr>
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Preventing Vasospasm

Acute Objectives:
- Arterio-selective vasodilation
- Prevent arterial spasm

Therapy:
1. Calcium antagonist
   - Nicardipine
   - Diltiazem
2. Nitroglycerin
3. Nitroprusside

Selectivity of Calcium Channel Antagonists

Nifedipine Nicardipine

IV Agent Vasodilation Myocardial Depression SA Node Suppression AV node Suppression

Nicardipine
Diltiazem
Verapamil
Angiotensin-Converting Enzyme Inhibitors (ACE-I)

Role in Cardiac Surgery

Clinical Indications:
- Essential hypertension
- CHF (compensated)
- Diabetic and non-diabetic nephropathy

Contraindications (Risk of Acute Renal Failure):
- MAP insufficient for renal perfusion
- Low cardiac output
- Volume depletion
- Renal vascular disease

Beta-Blockers: Role in Cardiac Surgery

Clinical Indications:
- Atrial fibrillation prophylaxis
- CHF (compensated)
- Myocardial ischemia or infarction
- Aortic aneurysm
- Non-cardiac operations (high risk for CAD)

Contraindications:
- Decompensated CHF
- Regurgitant valve lesions
- Reactive airway disease
- Bradycardia

Relative Risk/Benefit of Preoperative Beta-Blockade in Selected Subgroups

Analysis was performed on operative mortality using propensity-matched pairs from STS database of 629,677 CABG patients spanning 1996 to 1999.

Ferguson TB. JAMA 2002;287:2221-7

Use of Sodium Nitroprusside in Post-Coronary Bypass Surgery. A Plea for Conservatism.


- Incidence of SNP Toxicity 7/292 (2.4%)
- Duration of SNP infusion 26 - 160 hr
- Total SNP Dose 1.8 - 12 mg/kg
- Signs of Toxicity Tachyphylaxis, Encephalopathy
- Mortality 3/7 (43%)
Cases of Probable Nitroprusside Toxicity

FDA (U.S.A.) Adverse Drug Reports: 1974 to 1992

Demographics (n = 52)
- Age: < 1 year to 86 years
- Gender: 40% Female
- Duration of Drug Therapy: < 1 day to 14 days

Outcome (n = 52)
- Death: 29 (56%)
- Permanent Neurologic Injury: 3 (6%)
- Recovered: 13 (25%)
- Unknown: 7 (13%)

Principles of Blood Pressure Management To Improve Perioperative Outcomes

1. Balance risk of HTN versus risk of hypoperfusion.
2. Keep MAP within 20% of baseline values.
3. Recognize and avoid treatment adverse events.
4. Transition to agents with proven long-term benefit, e.g. beta-blockers, ACE-inhibitors, Calcium channel antagonists, diuretics (Level I evidence).

NIC vs. NTP for HTN after CEA: J Clin Anesth 2001;13:16-19


Clinical Investigations

Postoperative hypertension: A multicenter, prospective, randomized comparison between intravenous nicardipine and sodium nitroprusside

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