PERIOPERATIVE HTN MANAGEMENT

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Introduction

• One of the most common worldwide disease.
• Worldwide, hypertension affect as many as 1 billion people and be responsible for about 7.1 million death/year (WHO2002).
• Perioperative hypertension is commonly encountered in patients posted for surgery
• Many of these patients found to be hypertensive for the first time during routine checkup before surgery
Peri-operative Hypertension

• The term perioperative refers to the time of hospitalization directly related to a surgical procedure and includes pre, intra and postoperative (3-4 days post) periods

• Importance:
  - Increased risk of cardiovascular events.
  - Increased postoperative morbidity and mortality
  - Associated with end-organ damage

• Perioperative hypertension occurs in 25% of hypertensive patients that undergo surgery (Goldman and Caldera 1979)

• During surgery, patients with and without preexisting hypertension are likely to develop blood pressure elevation and tachycardia during the induction of anesthesia. (Erstad and Barletta 2000)

• Common prediction of perioperative hypertension are previous history of hypertension, especially a diastolic blood pressure more than 110 mmHg and the type of surgery. (Aronson et al. 2002)
• Perioperative Hypertension occurs during

1- Induction of anesthesia
2- Intraoperative due to pain induced sympathetic stimulation
3- Hypothermia
4- Hypoxia
5- Intravascular volume overload
6- 24 to 48 hours post operative as fluid is shifted from extravascular space

• At least 45% of hospitalized patients have preexisting hypertension

• About 25% of surgical patients have preexisting hypertension

• Hypertensive patients frequently have coexisting cardiac and vascular disease

Physiology: Perioperative HTN

- Increase SVR, increase preload
- Rapid intravascular volume shifts
- Renin-angiotensin activation
- Adrenergic stimulation (cardiac & neural)
- Serotonergic overproduction
- Baroreceptor denervation
- Altered cardiac reflexes
- Depth anesthesia inadequate
- Cross clamp

Classification

<table>
<thead>
<tr>
<th>Category</th>
<th>Systolic mmHg</th>
<th>Diastolic mmHg</th>
</tr>
</thead>
<tbody>
<tr>
<td>Optimal</td>
<td>&lt; 120</td>
<td>&lt; 75</td>
</tr>
<tr>
<td>Normal</td>
<td>&lt; 130</td>
<td>&lt; 85</td>
</tr>
<tr>
<td>Mild HTN</td>
<td>140-159</td>
<td>90-99</td>
</tr>
<tr>
<td>Moderate</td>
<td>160-179</td>
<td>100-109</td>
</tr>
<tr>
<td>Severe</td>
<td>&gt; 180</td>
<td>&gt; 110</td>
</tr>
<tr>
<td>Isolated SBP HTN</td>
<td>&gt; 140</td>
<td>&lt; 90</td>
</tr>
<tr>
<td>Pulse Pressure</td>
<td>&gt; 65mmHg</td>
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<tr>
<td>Orthostatic changes</td>
<td></td>
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<tr>
<td>Hyper response</td>
<td>&gt; 20 mmHg</td>
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<tr>
<td>Hypo response</td>
<td>&lt; 20 mmHg</td>
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Preoperative concerns

• All elective surgery patients with cardiovascular risk factors should undergo preoperative optimization i.e control of blood pressure, correction of electrolytes, glucose control etc..
• Hypertension mild or moderate and not associated metabolic or cardiovascular abnormalities. Do not delay surgery.
• Surgery should be cancelled in patients with hypertension and end organ damage till optimization of cardiovascular status. (Howell et al. BJA2004)

• Patients with chronic hypertension <110 mmHg don’t delay surgery.
• Urgent situations, rapidly acting IV agents to be used.
• Patients with newly diagnosed mild hypertension, treatment may be delayed till after surgery
• Hypertensive patients must continue on their anti hypertensive drugs perioperatively
• ACEI and AT1 receptor antagonists associated with intraoperative hypotension, discontinue 10 hours before surgery
• Symptoms of clonidine withdrawal are typically encountered 18 - 24 hours after sudden discontinuation of clonidine in patients taking more than 1 mg / day

• Clonidine patch pre operatively or dexmedetamidine, an IV rapidly acting a-2 adrenergic agonist, may have utility in patient with Clonidine withdrawal syndrome.

• Preoperative B blockers:
  - Proven to Be beneficial in cardiac surgery
  - For non cardiac surgery good results in high risk patients not in low risk (NEJM 2005)

• Associated with lesser incidence of perioperative ischemia
• Intraoperative hypotension, precipitation of asthmatic attack, major disadvantage
Intraoperative Concerns

- Target range for intraoperative BP control:
  - BP days to weeks before surgery
  - presence of associated co morbidities
  - Type of surgery
- Maintained within 20% of the preoperative level
- Acute elevation in BP (>20%) in the intraoperative period are typically considered hypertensive emergencies (Goldberg and Larijani 1998)

- Stressful Intraoperative events
  - Intubation
  - surgical incision
  - Emergence from GA and extubation
- During induction:
  - Normotensive: BP rises by 20 mmHg. HR 15-20 bpm.
  - Untreated hypertensive: SBP rises by up to 90 mmHg and HR by 40 bpm
  - Patients with preexisting HTN: more labile BP leading to myocardial ischemia
• Other causes of intraoperative hypertension:
  - Inadequate depth of anaesthesia
  - Pain
  - hypercarbia
  - hypoxemia
  - bladder distension
  - hypervolemia

• Exaggerated response in hypertensive patients:
  - Increase sympathetic tone
  - Decreased intravascular volume

• Achieving hemodynamic stability is more important than targeting an arbitrary BP
• Reduction of diastolic BP by 10-15% or to approx 110 mmHg over a period of 30-60min
• Concurrent gentle volume expansion to restore organ perfusion and to prevent sudden decline in BP after initiation of antihypertensive
• Chronic hypertensive - cerebral and renal auto regulation shifted to higher range – more prone to hypoperfusion if BP lowered rapidly
Postoperative Concerns

• Acute post operative hypertension is the significant BP elevation in the immediate post operative period that may lead to serious neurological, cardiovascular or surgical site complications and requires urgent management.

• There is no standard definition for this disorder.

• Postoperative HTN arbitrary defined as systolic BP $\geq 190$ mmHg and / or DBP $100$ or more on 2 consecutive reading following surgery (Chobanian et al. 2003)

• Post operative HTN. often begin 10-20 minutes after surgery and may last up to 4 hours (Towne and Bernhard 1980)

Adverse Consequences of Uncontrolled Hypertension

• Postsurgical
  – Hemorrhage
  – Suture line disruption
  – Aortic dissection

• End Organ Injury
  – Myocardial ischemia
  – Stroke
  – Renal failure

• Pulmonary Edema
Hypertension and Perioperative Risk

End organ involvement

Type of surgery

Type of HTN

Treatment effectiveness

HTN \rightarrow VASC DISEASE

Pulsatile flow
Endothelial cell dysfunction
Smooth Muscle cell hypertrophy

Pharmacotherapy

• Various options are available
• Ideal drug – rapid acting
• , predictable, easy titrated, in expensive and convenient
• Since an immediate reduction in BP is desired, parental agents is needed
Parenteral Treatment of Hypertension May Be Required During/After Perioperative Period

- Cardiac Surgery
- Major Vascular Surgery
  - carotid endarterectomy
  - aortic surgery
- Neurosurgery
- Head and Neck Surgery
- Renal Transplantation
- Major Trauma - Burns or Head Injury

IV Therapeutics

- Alpha Blockers
- ACE Inhibitors
- Beta Blockers
- Calcium Channel Blockers
- Diuretics
- Dopamine-1 Agonists
- Ganglionic Blockers
- Nitrovasodilators
- Other Vasodilators
Preoperative Hypertension

“Effective intraoperative management may be more important than preoperative hypertensive control in terms of decreasing clinically significant blood pressure liability and cardiovascular complications in patients who have mild to moderate hypertension.”

Goldman L, Caldera DL. Anesthesiology 1979;50:285-292

Therapeutic Considerations

Therapy

– Treat the underlying cause
– Provide adequate anesthesia/analgesia
– Administer antihypertensive medications
Treatment

- The approach to the treatment of perioperative hypertension is different from the treatment of chronic hypertension (Levy 1993)

- The initial approach to treatment is prevention.

- Hypertension due to tracheal intubation, surgical incision and emergence from anesthesia is treated with short acting B blockers, ACE inhibitors. CCB and vasodilators (Weiss and Longnecker 1993)

- Because many patients that develop postoperative HTN as a result of withdrawal of their long term antihypertensive medication, so this should be minimized in the postoperative period.

- Post operative rebound HTN due to withdrawal of anti hypertensive drugs. HTN may result in bleeding from vascular surgery suture lines. HTN associated with head trauma and HTN due to acute catecholamine excess (pheochromocytoma). Initial approach is to reverse precipitating factors (pain, hypervolemia, hypoxia, hypercarbia and hypothermia)
Hypertensive Emergencies: Initial Approach

- Multiple confirmations of BP, including all four extremities
- Assess target organ involvement
- Frequent monitoring of vital signs
- Initiate treatment immediately
- Use titratable therapy (parenteral)

Endpoints of Antihypertensive Therapy

Reduce MAP by 20-25%

or

Reduce MAP to 110-120 mmHg

(whichever is higher)

Achieve target BP within 2-4 hours
Conclusions

• Perioperative evaluation and management results from good communication between surgeon, anesthesiologist, primary care physician, and consultant
• Perioperative evaluation goals:
  – Accurately estimate perioperative risk
  – Lowering perioperative cardiac risk, if possible
  – Assess long-term risk
  – Address modifiable coronary risk factors

• Multiple pharmacologic agents produce vasodilation via different mechanisms.

• Beta-blockers are important in hypertension and tachycardia, but effects are limited by heart rate.

• Arterial vasoconstriction is characteristic of perioperative hypertension with intravascular hypovolemia.
• Nitrovasodilators decrease both preload and resistance vessels.

• DHP CCBs produce arterial selective vasodilation, controlling BP without producing venodilation or negative inotropic and conduction effects, and reverses vasospasm in the IMA and other vascular beds.