Management of Hypertension in patients undergoing surgery

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INTRODUCTION

- In the United States, it is that estimated approximately 72 million people suffer hypertension(Aronow WS 2011).
- Worldwide, hypertension may effect as many as 1 billion people and be responsible for 7,1 million death per year(Aronow WS 2011).
- Viet Nam HT 27% (2015 Nguyen Lan Viet).
- Hypertension is a frequent complication of cardiac surgery (Hass CE 2004)
- During surgery, patient with and without preexisting hypertension are likely to develop blood pressure elevations and tachicardia during the induction of anesthesia (Chobanian AV 2003)
- Common predictors of perioperative hypertension are previous history of hypertension, espectially a diastolic blood pressure greater than 110 mm Hg (Howell SJ 2004)
- Hypertension events occur most commomly with carotid surgery, abdoninal aortic surgery, peripheral vascular procedure and intraperitonial, or intrathoracic surgery(Hass CE 2004).
- Patients with uncontrolled hypertension (ie,>170/95 mmHg) undergoing carotid endarterectomies have been show to have a sinificantly greater number of posoperative neurologic deficits ($p<0,01$) than patients with better control or normotensive patients.(Chobanian AV 2003)
- Therefore, patients on antihypertensive therapy should maintain compliance to their treatment regimen prior to surgery, including the morning of surgery or during surgery.

Definition

- Hypertesion
- Diastolic pressure greater than 90-95 mmHg or systolic pressure greater than 140-160 mmHg.
- Borderline hypertension:
- Diastolic blood pressure 85-89 mmHg or systolic pressure of 140-159 mmHg.
- Accelerated/ Severe: Diastolic Blood pressure in excess of 110-115 mmHg.
- Malignant hypertension: More than 200/140 mmHg, associated with papillodema and frequently encephalopathy.

Hypertension Classification

Category	SBP (mmHg)	DBP (nnHg)
Optimal	<120	<80
Normal	<130	<85
High Normal	130–139	85–89
Grade 1(Mild)	140–159	90–99
Grade 2(Moderate)	160–179	100–109
Grade 3(Severe)	≥180	≥110
Isolated systolic Hypertension	≥140	<90

Hypertension Why Important ?

- Common disorder
- High risk factor for cardiovascular diseases
- End organ damage – Heart
  Brain & Kidney
- Alteration in cerebral & renal blood flow

Etiology of Intraoperative hypertension

Preexisting causes	**Undiagnosed or poorly controlled hypertension, pregnancy induced hypertension.**
Increased sympathetic tone	**Inadequate analgesia, inadequate anesthesia, Hypoxemia, Airway manipulation like laryngoscopy, extubation etc, Hypercapnia**
Drug overdose	**Adrenaline, epinephrine, ketamine, and ergometrine**
Others	**Hypervolemia, Aortic cross clamping, Phaeochromocytoma, and malignant hyperthermia**

Intubation hypertension

- Laryngoscopy & intubation are known causes of hypertension
- It is severe if laryngoscopy is prolonged
- Can be minimized by pre administration of lignocaine.

Inadequate anaesthesia

- Stimulation during inadequate anaesthesia
- The depth of anaesthesia can be monitored by BIS
- Tachycardia, sweating, grimacing, tears and movement indicate inadequate anesthesia
- Beware of empty vaporizers

Hypercapnia

- Increased sympathetic stimulation causes hypertension
- Watch out for:
  - inadequate tidal volume
  - Depleted soda lime
  - Disconnection of circuits
  - Inadequate fresh gas flow
- Malignant hyperthermia and thyrotoxicosis
- Exogenous admn of carbondioxide during laproscopic procedures

Hypoxemia

- Hypoxia increases cardiac output
- In severe hypoxia the systolic blood pressure is raised
- Severe systolic hypertension is a very late sign of hypoxemia and indicate complete circulatory collapse.

Pharmacological adjuvants

- Inotropic & vasoconstrictor agents
- Local anesthetic solutions containing adrenaline if injected intravenously
- Nasal packing
- Medication errors

Surgical procedures

- Aortic cross clamping
- Aortic valve replacement
- Carotid endarterectomy

Management

- Preanesthetic evaluation
- Perioperative risk reduction
- Premedication
- Balanced anesthesia
- Proper monitoring
- Parenteral medications

Preanesthetic evaluation

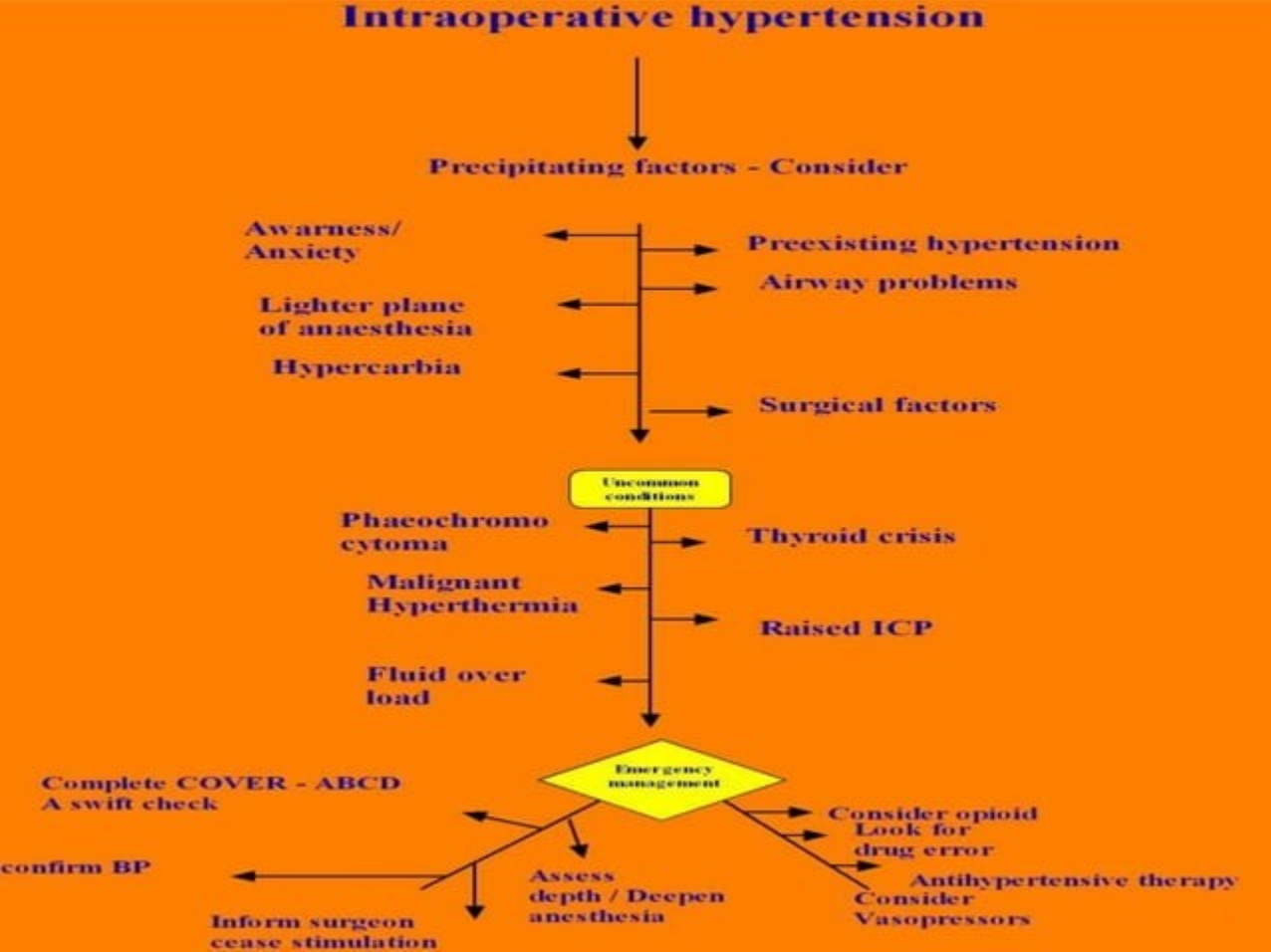
- History
- Physical examination
- Adequacy of blood pressure control

Perioperative risk reduction

- Effective control of blood pressure
- Anti Hypertensive drug therapy
- Hydration
- Choice of anesthetic agent
- Adequate analgesia
- Miscellaneous

Agent	Dosage	Onset	Duration
Nitroprusside	0.5 – 10 ug/kg/min	30-60sec	1-5 mins
Nitroglycerine	0.5 – 10 ug/kg/min	1 min	3 – 5mins
Esmolol	0.5mg/kg in 1 min 50 – 300 ug/kg/min infusion	1 min	12-20 mins
Labetolol	5-20 mg	1-2mins	4-8 hrs
Propranalol	1-3 mg	1-2 mins	4-6 hrs
Trimethaphan	1-6 mg / min	1-3 mins	10-30 mins
Fentolamine	1-5 mg	1 – 10 mins	20-40 mins
Diazoxide	1-3 mg /kg slowly	2-10 mins	4 – 6 hrs
Hydralazine	5-20 mg	5-20 mins	4-8 hrs
Nifidepine s/l	10 mg	5-10 mins	4 hrs
Methyl dopa	250 – 1000 mg	2-3 hrs	6-12 hrs
Nicardipine	0.25 – 0.5 mg	1-5 mins	3-4 hrs
Enalapril	0.625 – 1 mg16	6-15 mins	4-6 hrs
Fenoldopam	[illegible] 1.6 ug/kg/min	5 mins	5 mins

1	Urgent reduction of severe acute hypertension	Sodium nitroprusside infusion 0.3 – 2 mic.g/kg/min
2	HT with ischemia with poor LV	NTG infusion 5 – 100 mic.g/kg
3	HT with ischemia with Tachycardia	a. Esmolol bolus or infusion 50 – 250 micg/kg/min b. Labetolol bolus orr infusion 2 – 10 mg; 25 – 30 mic. G /kg
4	HT with heart failure	Enlapril at 0.5 – 5mg bolus, 1.25 mg/6 hours given over 5 mins. Response within 15 mins
5	HT without cardiac complications	Nifidepine – 5 – 10 mg S/l Nicardipine infusion – 5 – 15 mg/hr Hydralazine 5 – 10 mg bolus
5	HT with Phaeochromocytoma	Labetolol – Bolus 2 – 10mg Infusion 2.5 – 30 mic g/kg/min Phentolamine 1-4mg bolus


Intraoperative hypertension
Precipitating factors - Consider
Awarness/ Anxiety
Preexisting hypertension
Airway problems
Lighter plane of anaesthesia
Hypercarbia
Surgical factors
Uncommon conditions
Phaeochromo cytoma
Thyroid crisis
Malignant Hyperthermia
Raised ICP
Fluid over load
Emergency management
Complete COVER - ABCD
A swift check
confirm BP
Inform surgeon cease stimulation
Assess depth / Deepen anesthesia
Consider opioid
Look for drug error
Antihypertensive therapy
Consider Vasopressors

Conclusion

- Perioperative management of hypertension in patients undergoing surgery has been a longstanding problem.
- With wide range of antihypertensives and clinical experiences, there is no unanimity regarding the management of these patients.
- Therefore, it is essential to develop a consensus guidelines regarding the perioperative management of hypertension.
- It includes appropriate patient selection, preoperative evaluation of the patient including the assessment of end-organ damage, appropriate therapeutic goals and drug selection for the intraoperative and postoperative hypertension management.

THANK YOU!