

# **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

## **Epidemiology and Relevance**

- 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

Goldman L, et al. N Engl J Med 1977;297:845-850

## 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

Category	Systolic mmHg		Diastolic mmHg
Optimal	< 120	and	< 75
Normal	< 130	and	< 85
Mild HTN	140-159	or	90-99
Moderate	160-179	or	100-109
Severe	> 180	or	> 110
Isolated SBP HTN	> 140	and	< 90
Pulse Pressure	> 65mmHg		
Orthostatic changes	Hyper response > 20 mmHg		
	Hypo response < 20 mmHg		

## 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 dexmedetomidine, an IV rapidly acting  $\alpha$ -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 hyperperfusion 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

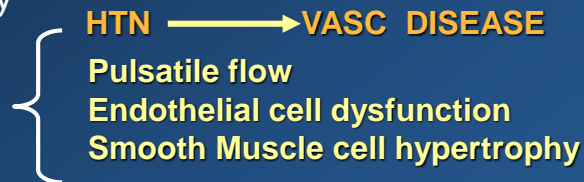
## Hypertension and Perioperative Risk

End organ involvement

Type of surgery

Type of HTN

Treatment effectiveness



## 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.

