

**Anesthesia for**

# **Abdominal Aortic Aneurysm (AAA)**

**RAJIT SRICALERM**

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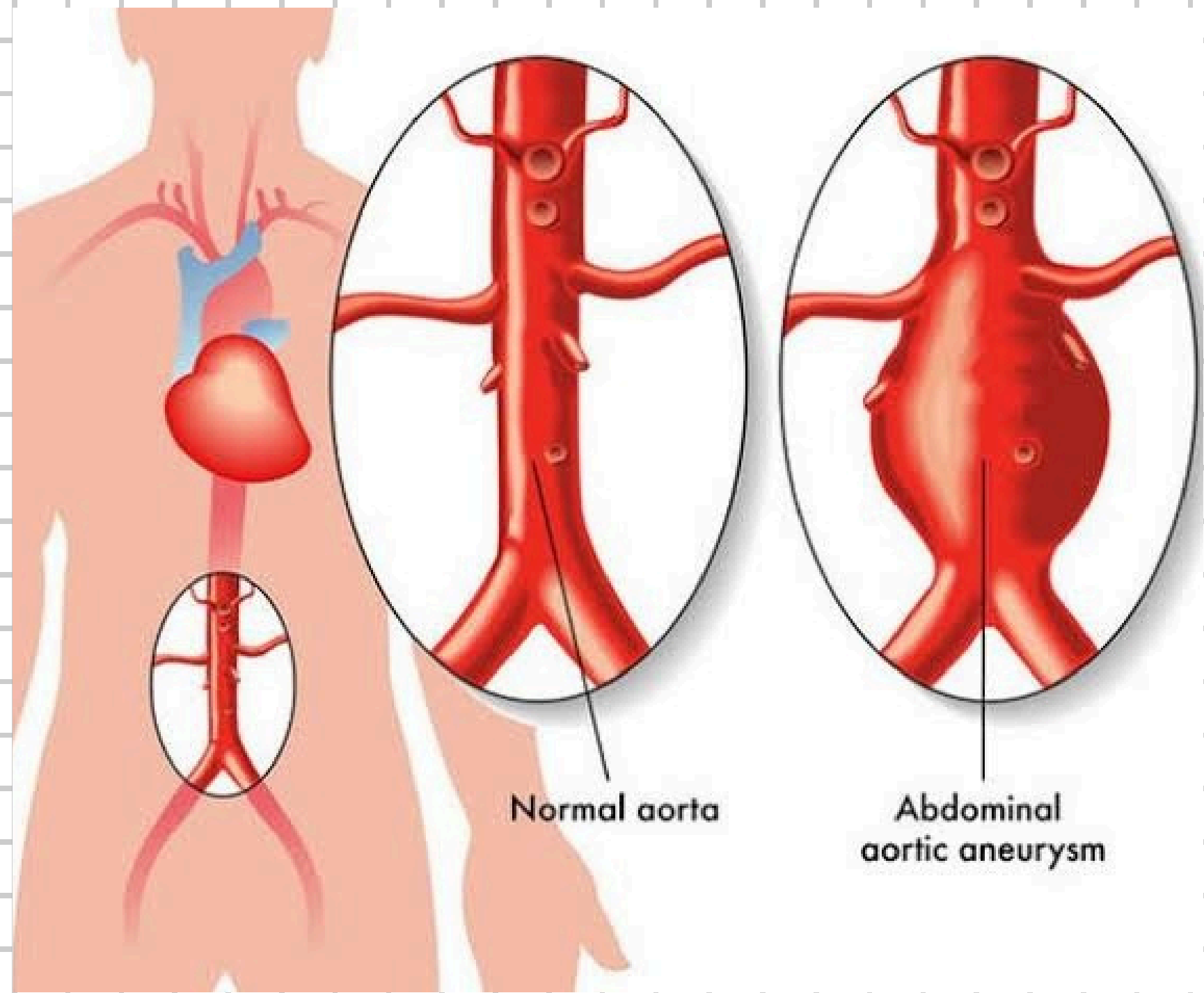
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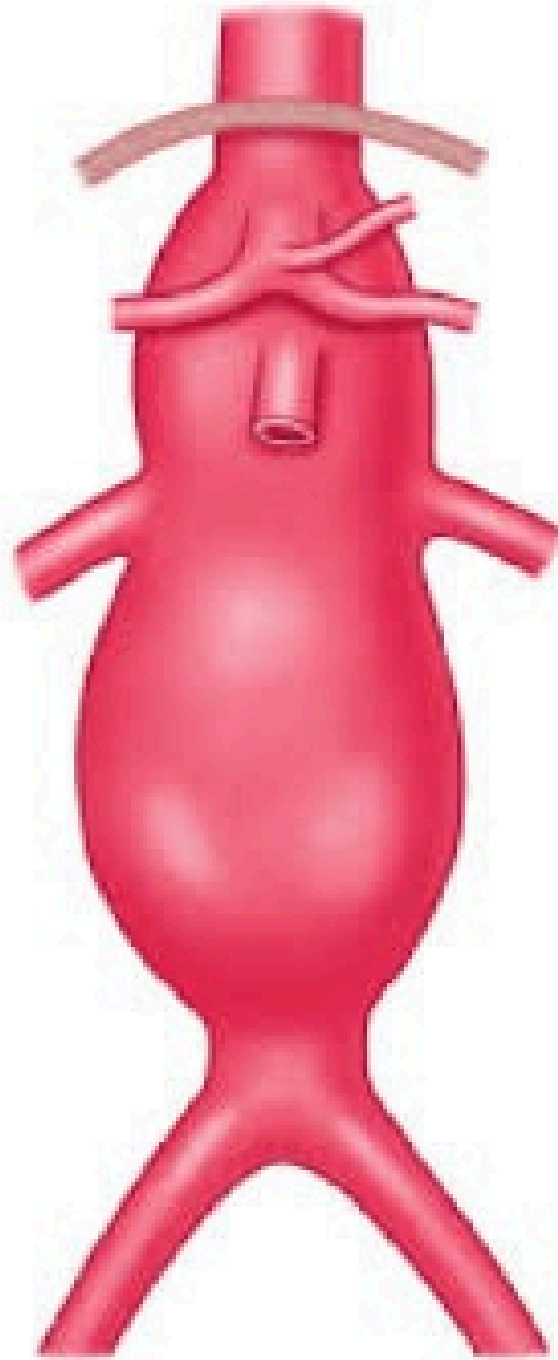


# WHAT IS AAA?

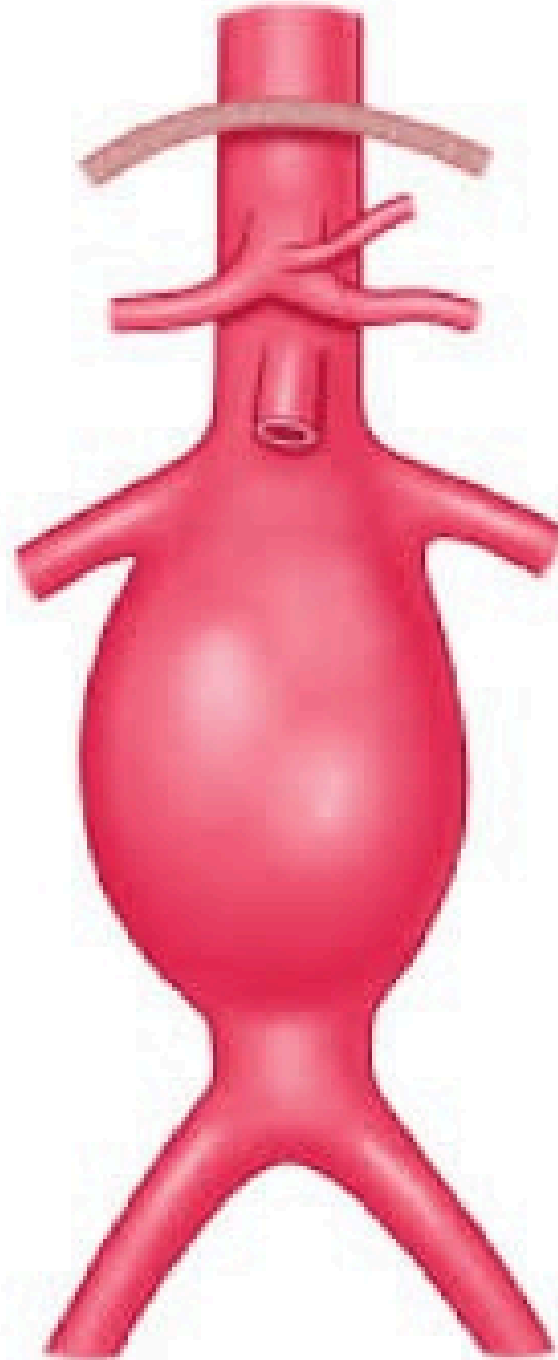
Aortic aneurysm is a bulging, dilation or ballooning in the wall of a blood vessel, usually an artery, that is due to weakness or degeneration that develops in a portion of the artery wall.

# Classification of Aortic Aneurysm

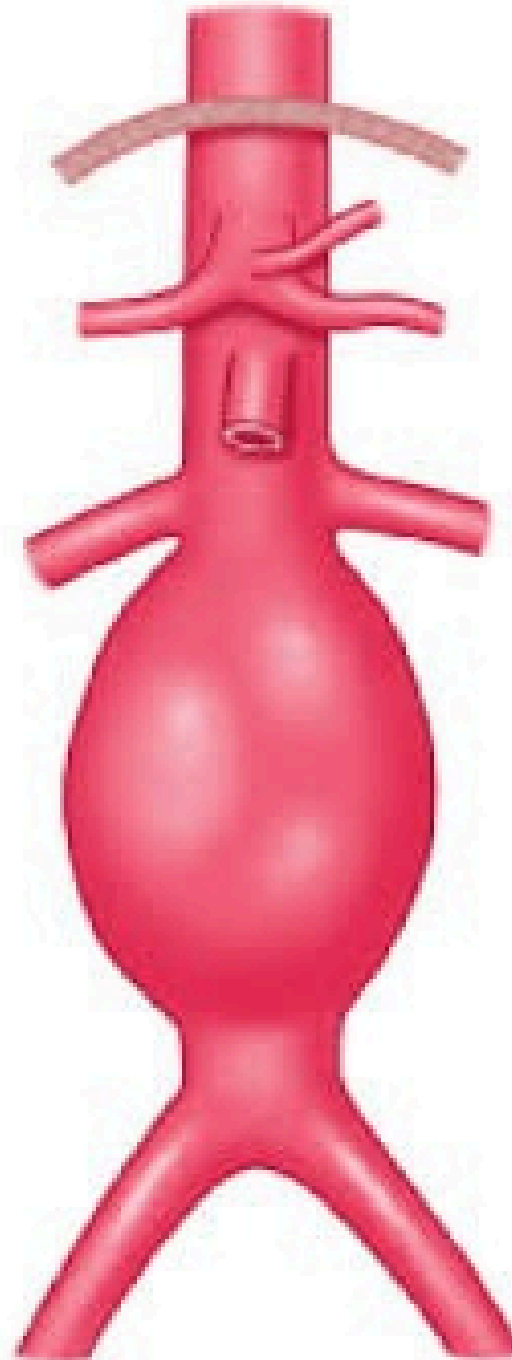
Suprarenal AAA



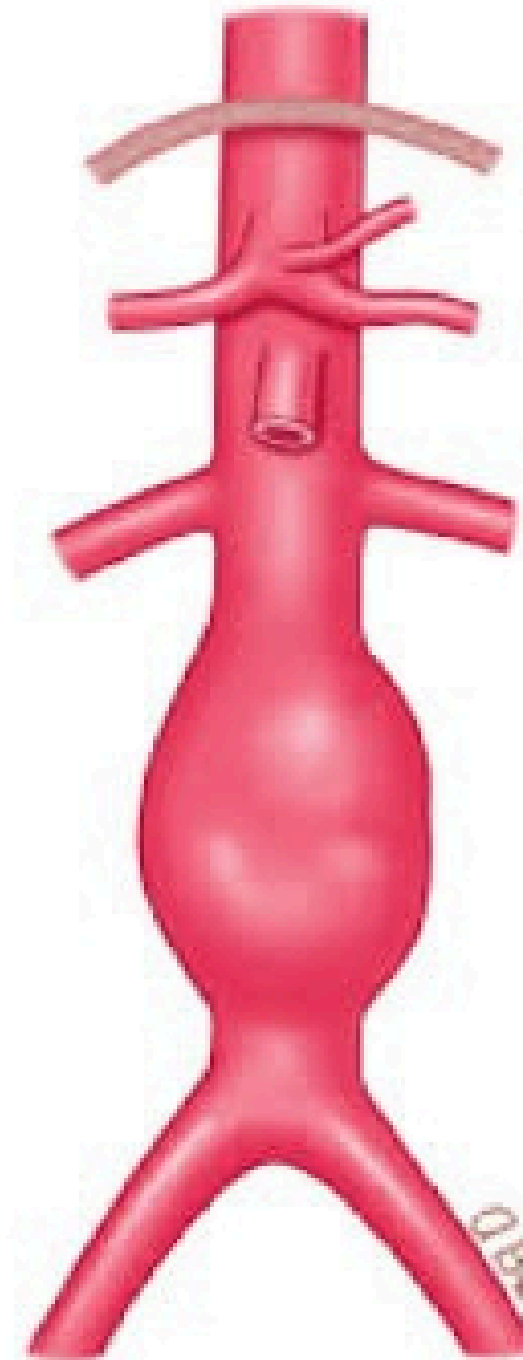
Pararenal AAA



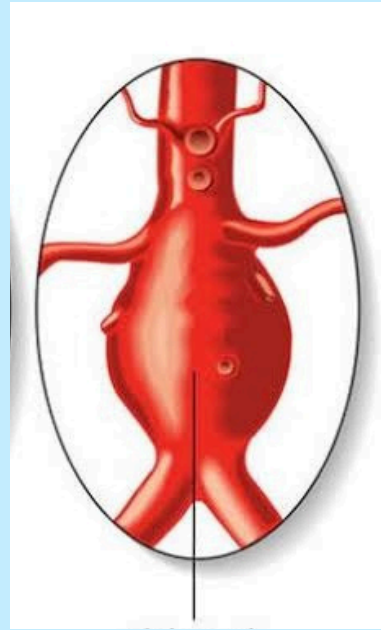
Juxtarenal AAA



Infrarenal AAA



# AAA



## Symptoms

- ปวดท้อง
- ปวดหลัง
- Pulsatile mass (ก้อนเต้นตามจังหวะเต้นของหัวใจบริเวณสะดือ)
- ถ้ารุนแรงจะมีอาการปวดท้องเฉียบพลัน, ความดันโลหิตต่ำ

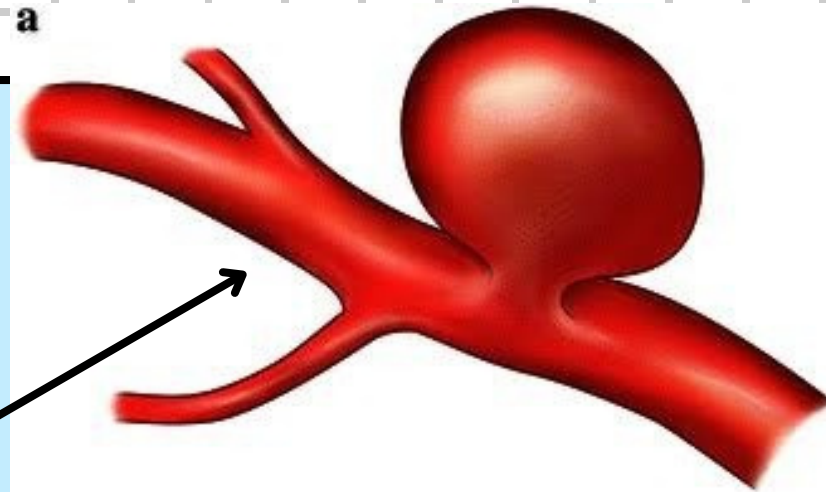
## Causes

- Atherosclerosis (is the most common cause), vasculitis, cystic medial necrosis, aging, smoking, family history of AAA

- Chronic inflammation
- Orther: trauma, mycotic infection, Marfan syndrome

# INDICATION

## for Surgery



Saccular Aneurysm

- Saccular shape
- Size > 5.5 cms.
- Expand > 0.5 cms./  
6 months
- Complication : rupture,  
infection, inflammation,  
distal embolization, fistula

## INVESTIGATION

- Abdominal ultrasonography
- Plain abdominal x-ray
- CTA whole aorta

# CHOICE OF SURGERY

## Open abdominal aortic surgery

**Pros :** No CTA F/U

### Cons

- Large incision
- Clamping+unclamping of aorta and major branches : duration organ ischemia-reperfusion
- Significant fluid shifts
- Temperature fluctuations
- Activation of neurohumoral and inflammatory responses

## Endovascular aortic aneurysm repair

**Pros :** Less invasive  
: Shorter hospital stay

### Cons

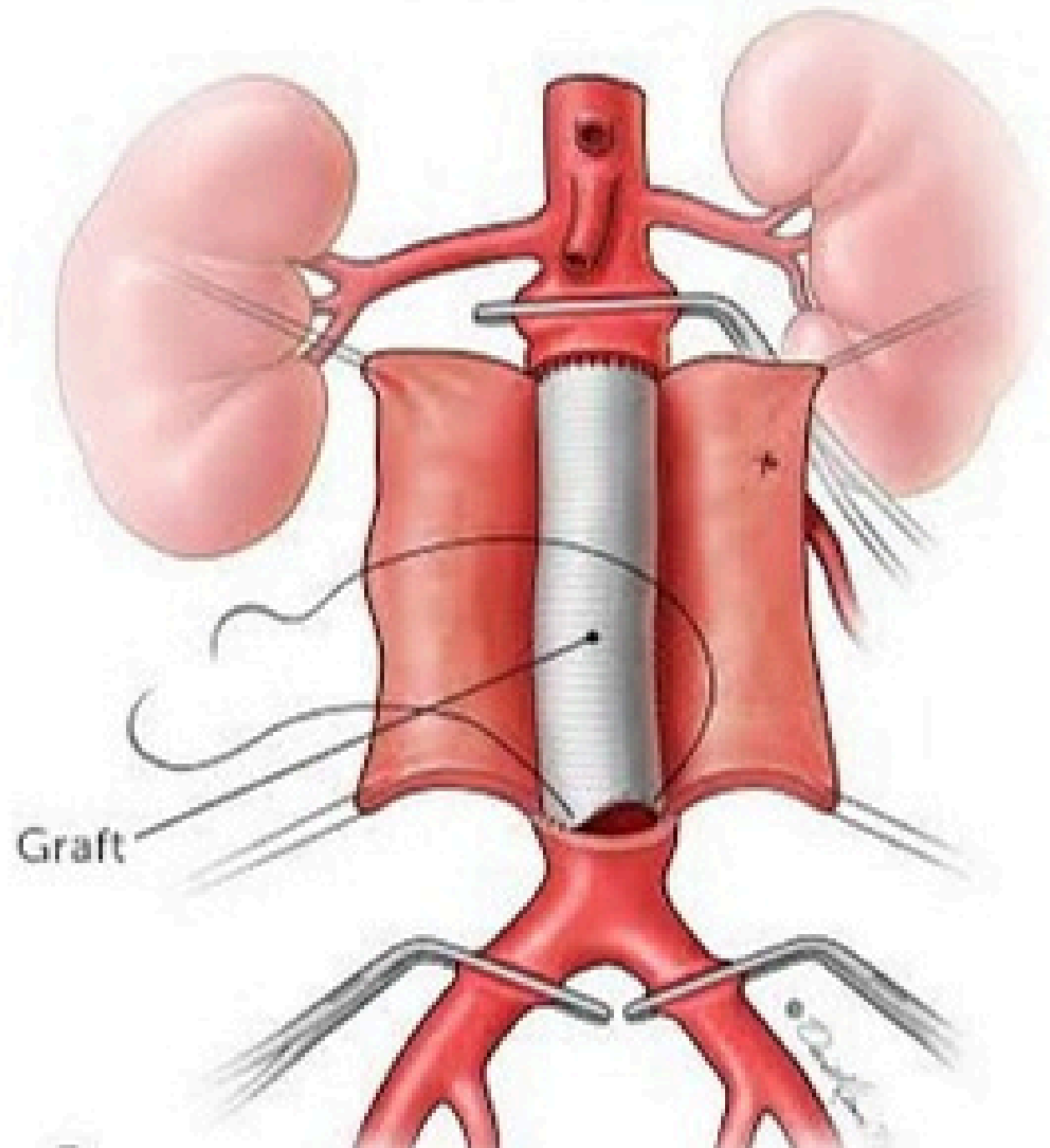
- Endoleak
- CTA F/U life -long

### Contraindication

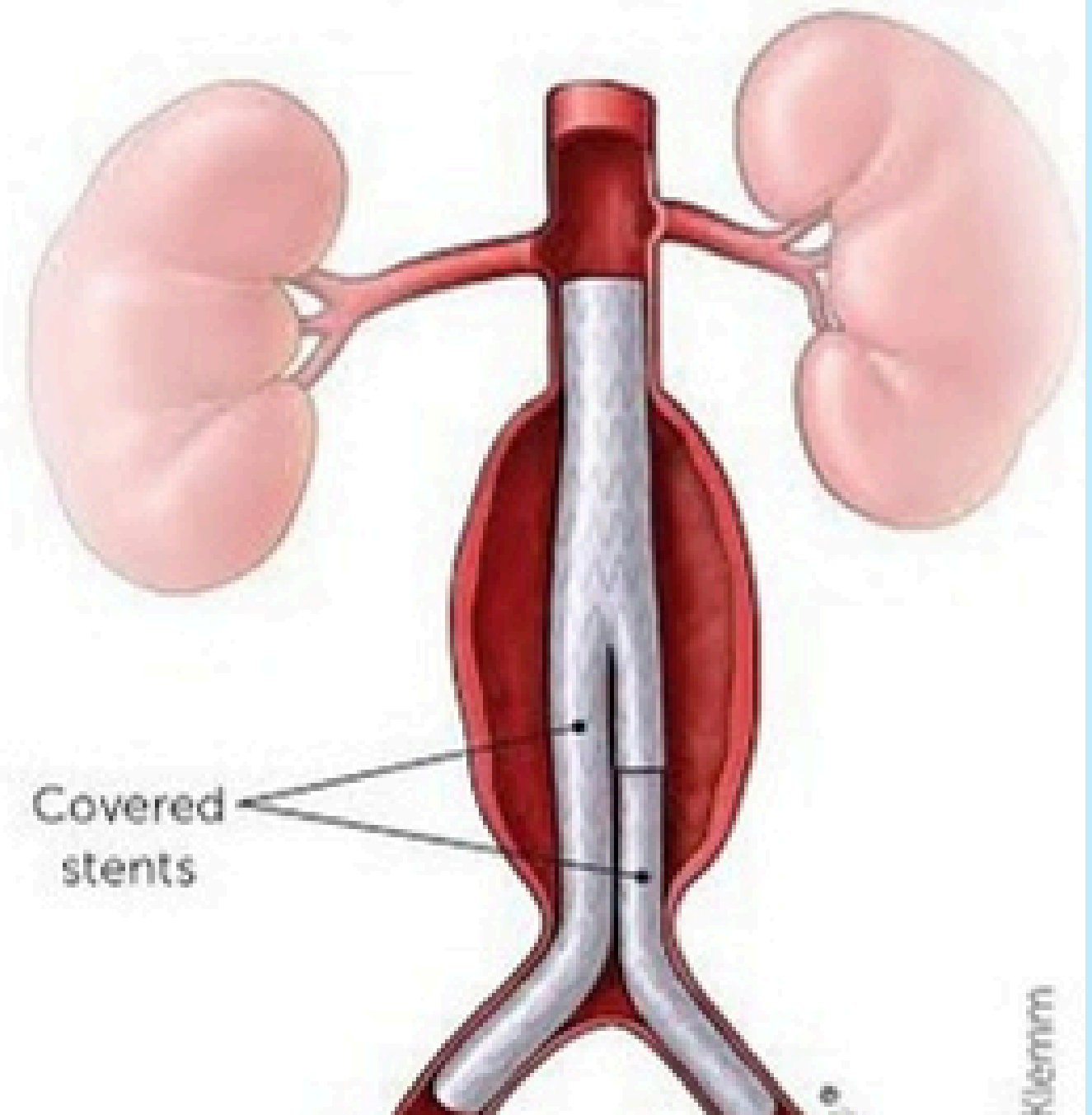
- Rupture with hemodynamic unstable
- Infection aneurysm
- Unsuitable anatomy

# CHOICE OF SURGERY

Open abdominal aortic surgery



Endovascular aortic aneurysm repair



# CHOICE OF ANESTHESIA

GA

**Pros :** prolonged operation, promptly initiated, full monitoring  
**Cons :** medications effect

RA

**Pros :** Lowering BP, Post op pain control  
**Cons :** cannot use in coagulopathy

LA

**Pros :** least invasive, less BP effect  
**Cons :** patient's cooperation

# MANAGEMENT OF ANESTHESIA

## Preoperative evaluation

- **Get important data:** U/D, smoke, medication anti-platelet, anti-coagulation
- **Multidisciplinary team:** blood bank, surgeon, scrub nurse
- **Preparing ICU**

## Intraoperative management

- **Choice of anesthesia**
- **Monitoring**
- **Hemodynamic**
- **Organ protection**

## Postoperative management

- **Observe ICU**
- **Monitor and correction:**
  - hemodynamic
  - temperature
  - coagulation
  - acid-base metabolic
- **Pain control**

# INTRAOPERATIVE MANAGEMENT

## MONITORING

- Standard monitoring
- Invasive monitoring
- **Preinduction A line**
- **C line for drug infusion, fluid resuscitation**
- Temperature
- Urine output

## HEMODYNAMIC

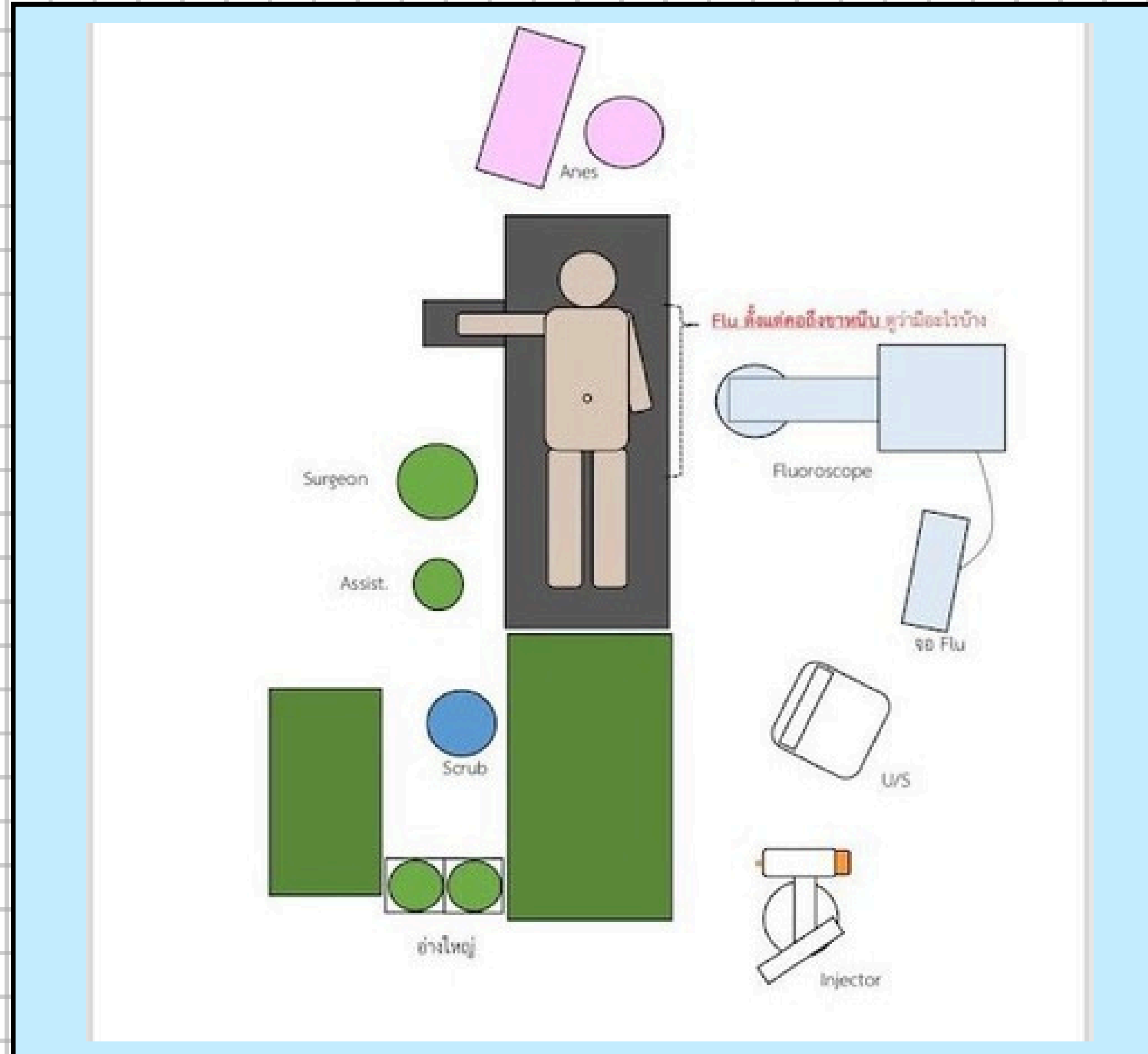
- **Initial phase**
- Keep SBP > 70 mmHg
- Limit fluid resuscitation
- **Induction phase**
- Rapid sequence induction
- Full invasive monitoring
- **Maintenance phase**
- Balance anesthesia
- Rational blood and blood component administration
- **AOX / UNCLAMP**

## ORGAN PROTECTION

- **Heart**
- balance oxygen demand and supply
- **AOX: stabilized MAP**
- **Spinal cord**
- **Renal**

# INTRAOPERATIVE MANAGEMENT

EVAR (standard)





# Abdominal Aortic Aneurysm

Medical Legal Art

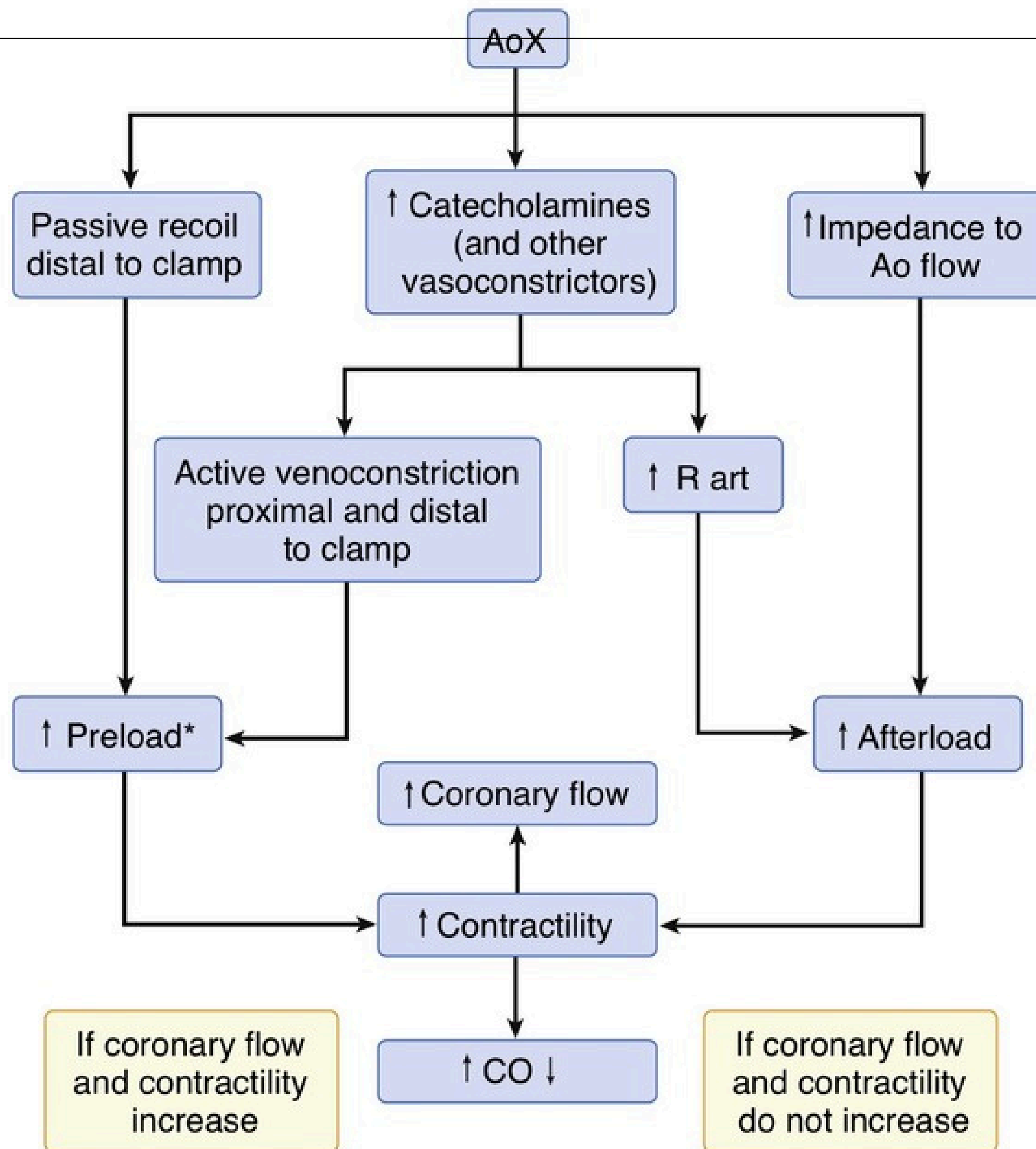
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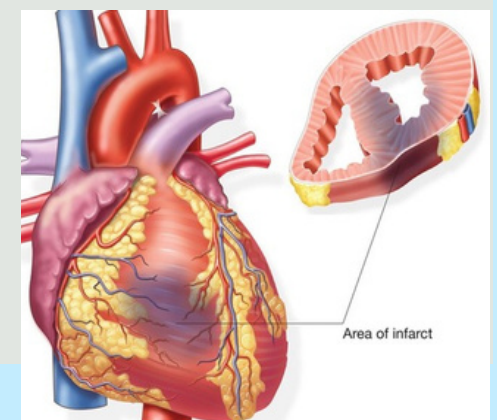
Watch on  YouTube



## BOX 56.1 Physiologic Changes With Aortic Cross-Clamping\* and Therapeutic Interventions

### Hemodynamic Changes

- ↑ Arterial blood pressure above the clamp
- ↓ Arterial blood pressure below the clamp
- ↑ Segmental wall motion abnormalities
- ↑ Left ventricular wall tension
- ↓ Ejection fraction
- ↓ Cardiac output<sup>†,‡</sup>
- ↓ Renal blood flow
- ↑ Pulmonary occlusion pressure
- ↑ Central venous pressure
- ↑ Coronary blood flow



AoX clamp increase afterload & LVEDP → O<sub>2</sub> demand

# Therapeutic during AoX

## Therapeutic Interventions

### Afterload reduction

Sodium nitroprusside

Inhalational anesthetics

Amrinone

Shunts and aorta-to-femoral bypass

### Preload reduction

Nitroglycerin

Controlled phlebotomy

Atrial-to-femoral bypass

### Renal protection

Fluid administration

Distal aortic perfusion techniques

Selective renal artery perfusion

Mannitol

Drugs to augment renal perfusion

### Other

Hypothermia

↓ Minute ventilation

Sodium bicarbonate

Maintain normal preload and cardiac output

- **Controlled (slow clamp) supraceliac AoX**
  - To avoid abrupt + stress to heart
- **Accept proximal aortic MAP  $\leq 120$  mmHg**
  - If friable aorta : keep lower MAP

# Aortic unclamping

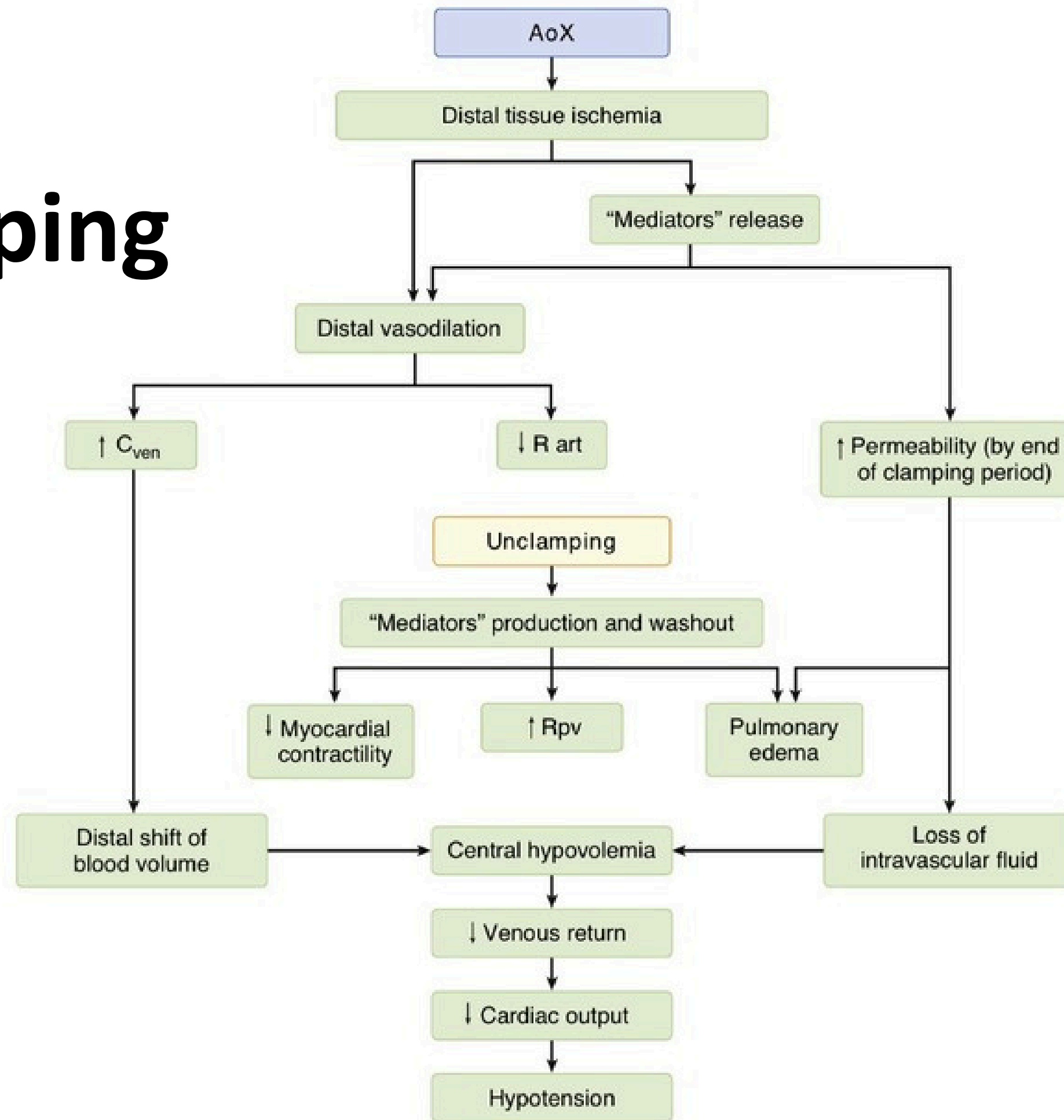


Fig. 56.4 Systemic hemodynamic response to aortic unclamping. AoX, Aortic cross-clamping; C<sub>ven</sub>, venous capacitance; R<sub>art</sub>, arterial resistance; R<sub>pv</sub>, pulmonary vascular resistance.

# Aortic unclamping

- **Hypotension caused by**

- Sudden decrease SVR
- Ischemic reperfusion injury : vasodilation & myocardial suppression
- Anatomotic bleeding

- **Management**

- Volume expansion with inotropic or vasopressors
- Correct metabolic acidosis and electrolyte derangement
- Gradual release of the clamp

Communication is the key

# Renal function and protection

- **Risk factor**

- Preoperative renal insufficiency
- Decrease renal blood flow
- Contrast media
- Aortic cross clamping
  - Reperfusion injury
  - Myoglobinuria
- Plasma mediator (RAAS)

AoX above renal artery : Dramatically ↓ renal BF

AoX below renal artery ↑ renal vascular resistant → ↓ Renal BF

Intraoperative urine output ≠ Post operative renal function

# Renal protection

- **Optimal systemic hemodynamics**
- Adequate hydration and perfusion
- Correct anemia
- **Avoid or limit use of nephrotoxic agents**
- **Pharmacologic protection before AoX**
- Mannitol (12.5 g/70 kg) : Improve renal cortical BF, scavenger of free radical
- Loop diuretics/ Low dose dopamine (1-3 mcg/kg/min) : increase renal BF (\*\*\*) surveillance of intravascular volume and electrolyte)
- Statin : preserved renal function after aortic surgery requiring suprarenal AoX
- **Glucose control**

# POSTOPERATIVE COMPLICATION

## LOCAL

- ALI (acute limb ischemia)
- Spinal cord ischemia
- Colonic ischemia
- Endoleak
- Graft infection
- Pain

## SYSTEMIC

- HEMORRHAGE
- AKI
- MI
- Atelectasis lung, pneumonia

