Anesthetic management of patients with ruptured aortic aneurysm

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- surgical emergencies
- urgent management
- rapid and efficient evaluation
- decision making

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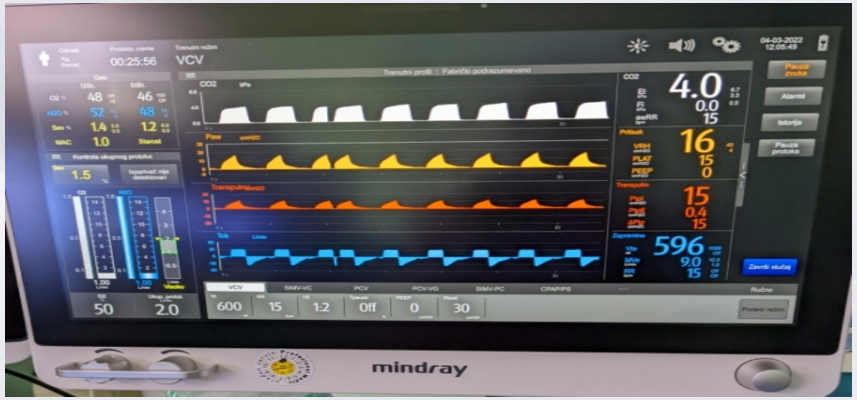
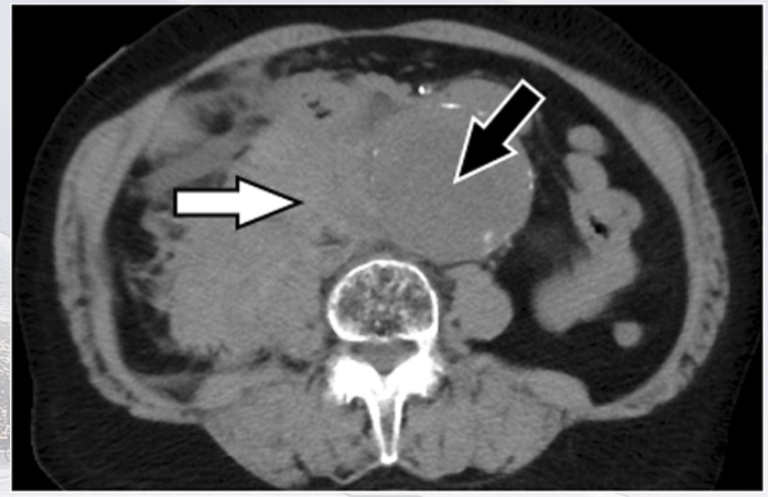


- mortality
- best outcomes:
  - larger bed numbers[1]
  - larger case volumes, threshold 15 RAAA per year [2,3]
  - surgical skill[4]
  - specialized vascular anesthesiologists[5]

1.Karthikesalingam A, Holt PJ, Vidal-Diez A, et al:Mortality from ruptured aortic aneurysms: Clinical lessons from comparison of outcomes in England and the USA. Lancet 383:963-969, 2014
2. Holt PJE, Poloniecki JD, Gerrard D, et al: Meta-analysis and systematic review of the relationship between volume and outcome in abdominal aortic aneurysm surgery. Br J Surg 94:395-403, 2007
3. Holt PJE, Karthikesalingam A, Poloniecki JD, et al: Propensity scored analysis of outcomes after ruptured abdominal aortic aneurysms. Br J Surg 97:4966-503, 2010
4. Birkmeyer JD, Stukel TA, Siewers AE, et al: Surgeon volume and operative mortality in the United States, N Enhl J Med 349:2117-2127, 2003
5. Walsh SR, Bhutta H, Tang TY, et al: Anaesthetic specialization leads to improve early- and medium-term survival following major vascular surgery, Eur J Vasc Endovasc 39:719-725, 2010



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RAAA

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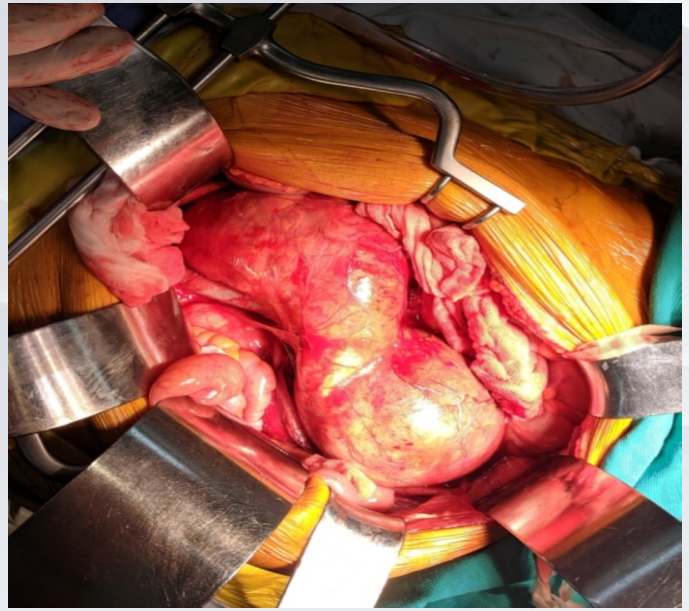
Preoperative management

- rapid preoperative assessment
- antibiotic prophylaxis [6]

6. Stewart A, Eyers PS, Earnshaw JJ, Prevention of infection in arterial reconstruction. Cochrane Database Syst Rev 2006: CD0030073.

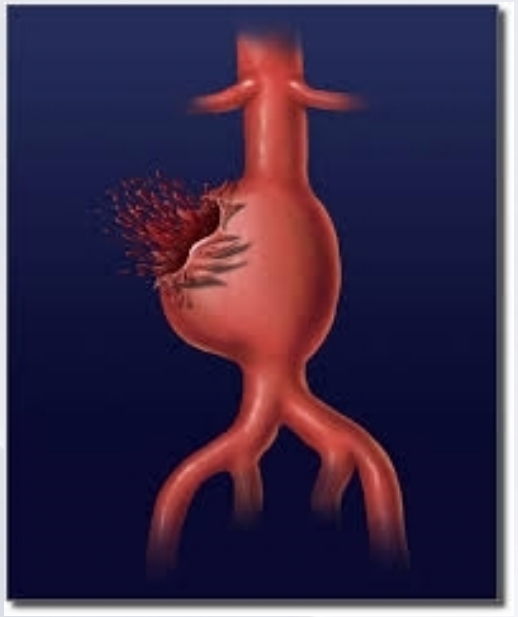
- permissive hypotension
- normothermia
- analgesia



Intraoperative management

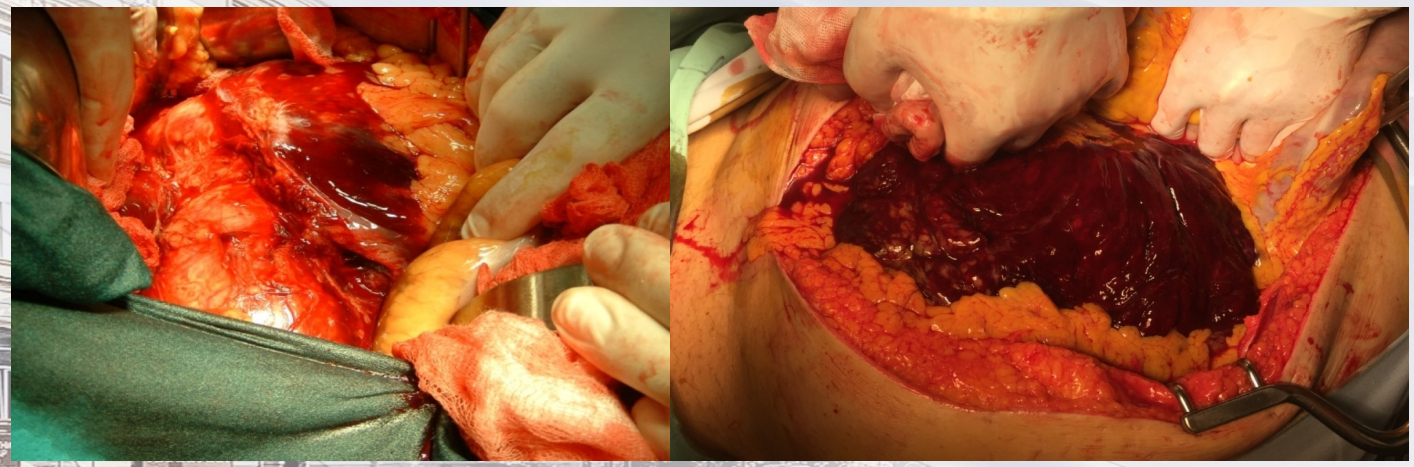
	Benefits	Disadvantages
Local anaesthesia	Fewer respiratory complications Spontaneous ventilation is preserving venous return Avoids muscle relaxants and loss of abdominal tone Avoids hypotensive effects of anaesthetic	Patient co-operation may be limited Pain from retroperitoneal haematoma or lower limb ischaemia can be problematic Transoesophagel echocardiography cannot be used Acid-base derangements following reperfusion are challenging to manage in a spontaneously breathing patient
General anaesthesia	Apnoea Induced hypotension and patient immobility during stent deployment are more easily achieved Rapid conversion to open repair if required Tolerance of long procedures	Possible respiratory complications and prolonged weaning Loss of tamponade effect of abdominal muscle tone Potential for GA-induced cardiovascular collapse

Intraoperative management



- invasive blood measurement
  - induction
    - central venous access
      - intravenous heparin administration [7,8]

7. Graham AP, Fitzgerald, O`Connor E, Hinchliffe RJ, Loftus IM, Thompson MM, et al. The use of heparin in patients with ruptured abdominal aortic aneurysms. Vascular 2012;20:61-4
8. Lammy S, Blackmur JP, Perkins JM. Intravenous heparin during ruptured abdominal aortic aneurysmal repair. Cochrane Database Syst Rev 2016;19:CD011486



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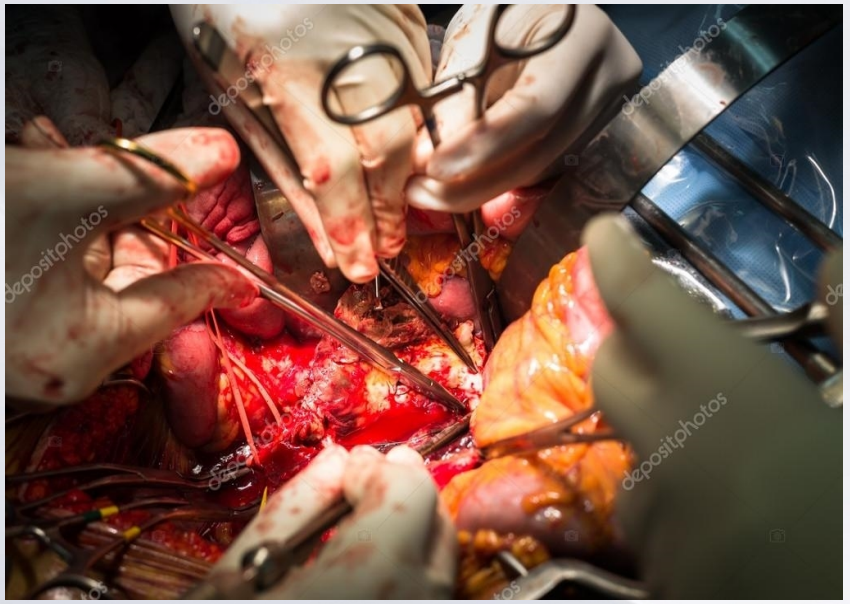
Intraoperative management

- **cross-clamping**
  - volume optimization
  - transfusion
  - hyperventilation
- **unclamping**
  - hyperventilation
  - vasoconstrictors
  - optimizing patient
- **closing phase**
  - instability
  - coagulopathy
  - correct acidosis
  - preserve mormothermia
  - red cell salvage
  - thight abdominal closure

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
- ↓ Renal blood flow
- ↑ Pulmonary occlusion pressure
- ↑ Central venous pressure



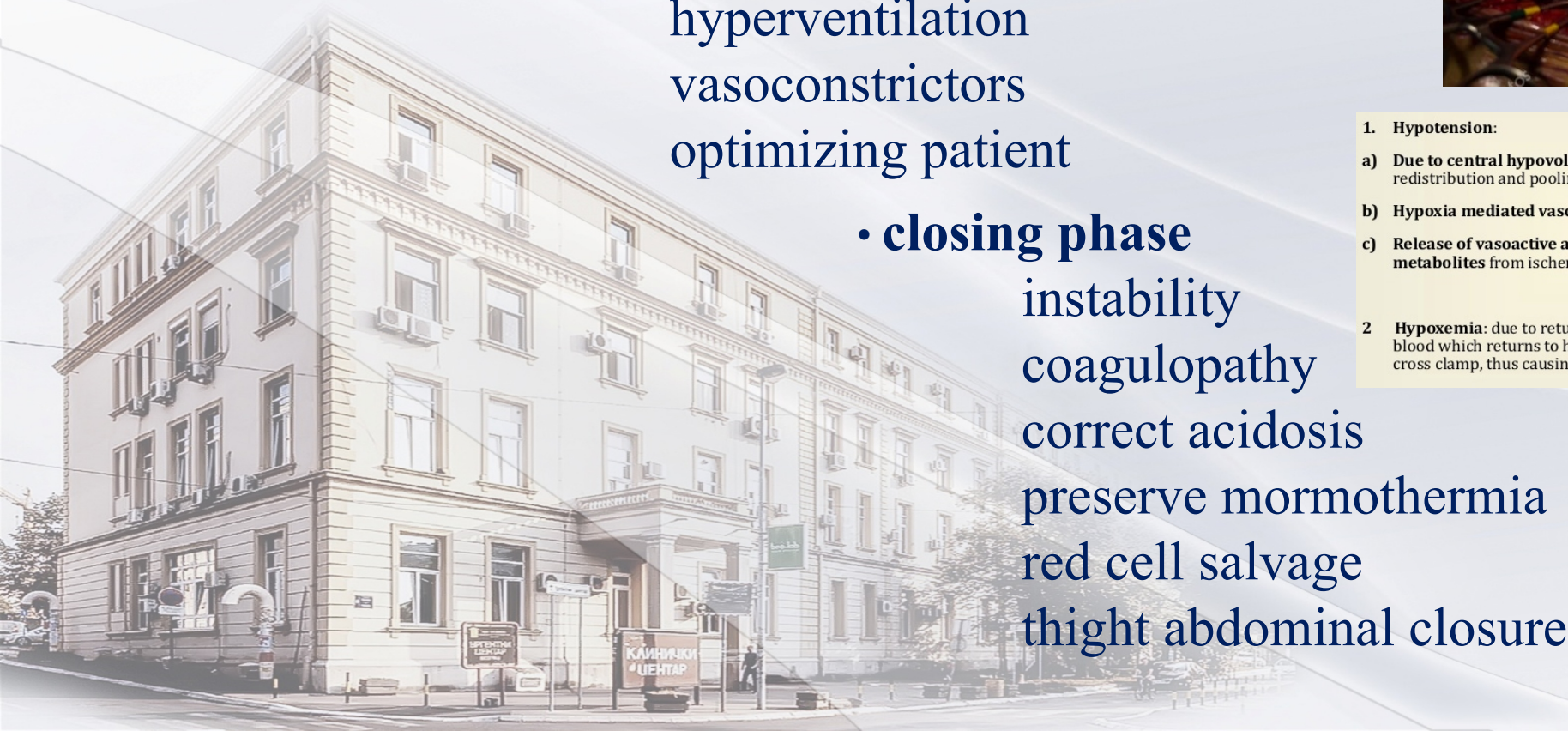
1. **Hypotension**:

a) **Due to central hypovolumia** caused by blood volume redistribution and pooling into reperfused tissue.

b) **Hypoxia mediated vasodilatation**

c) **Release of vasoactive and myocardial depressant metabolites** from ischemic tissue such as lactic acid.

2 **Hypoxemia**: due to returning of large volume of desaturated blood which returns to heart from hypoperfused tissue below cross clamp, thus causing temporary systemic hypoxemia.



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Postoperative management

- SIRS, multi organ failure
- ARDS
- cardiac ischaemia
- neurological problems
- intrabdominal pressure
- acute kidney injury

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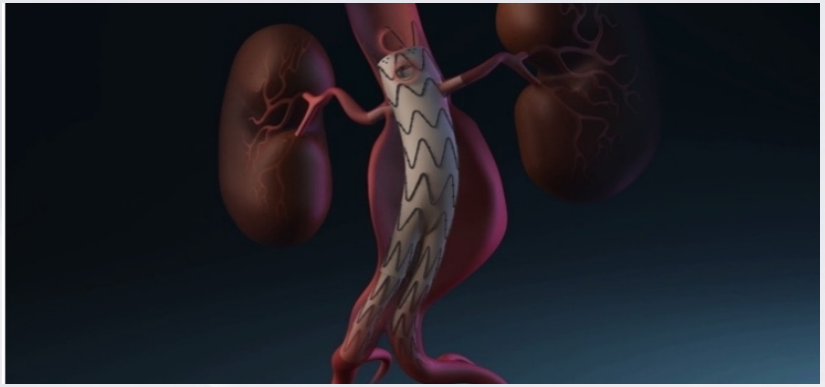
Role of EVAR



- 30-day mortality IMPROVE trial[9]
  EVAR 35,4% vs 37,4% open repair

9. IMPROVE Trial Investigators, Powell JT, Sweeting MJ, Thompson MM, Ashleigh R, Bell R, et al. Endovascular or open repair strategy for ruptured abdominal aortic aneurysm: 30 day outcomes from IMPROVE randomized trial. BMJ 2014;348:f7661.

- colonic ischemia[10,11,12]
  EVAR 23% vs 42% open repair

10. Becquemin JP, Majewski M, Fermani N, Marzelle J, Desgrandes P, Allaire E. et al. Colon ischemia following abdominal aortic aneurysm repair in the era of the endovascular abdominal aortic repair. J Vasc Surg 2008;47:258-63
11. Perry Rj, Martin MJ, Eckert MJ, Sohn Vy, Steele SR. Colonic ischemia complicating open vs endovascular abdominal aortic aneurysm repair. J Vasc Surg 2008;48:272-7
12. Champagne BJ, Lee EC, Valerian B, Mulhotra N, Mehta M. Incidence of colonic ischemia after repair of ruptured abdominal aortic aneurysm with endograft. J Am Coll Surg 2007;204:597-602

- general versus local anesthesia
  Eurostar[13,14], IMROVE trial[9]

9. IMPROVE Trial Investigators, Powell JT, Sweeting MJ, Thompson MM, Ashleigh R, Bell R, et al. Endovascular or open repair strategy for ruptured abdominal aortic aneurysm: 30 day outcomes from IMPROVE randomized trial. BMJ 2014;348:f7661.
13. Ruppert V, Leurs LJ, Steckmeir B, et al: Influence of anesthesia type on outcome after endovascular aortic aneurysm repair: An analysis based on EUROSTAR data J Vasc Surg 44(16-21):e2,2006
14. Ruppert V, Leurs LJ, Rieger J, et al: Risk-adapted outcome after endovascular aortic aneurysm repair: Analasys of anesthesia types based on EUROSTAR data J Endovasc Ther 14:12-22,2007

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Conclusions

- EVAR
- standardized protocols
- national guidelines
- prospective clinical research studies and randomized trials

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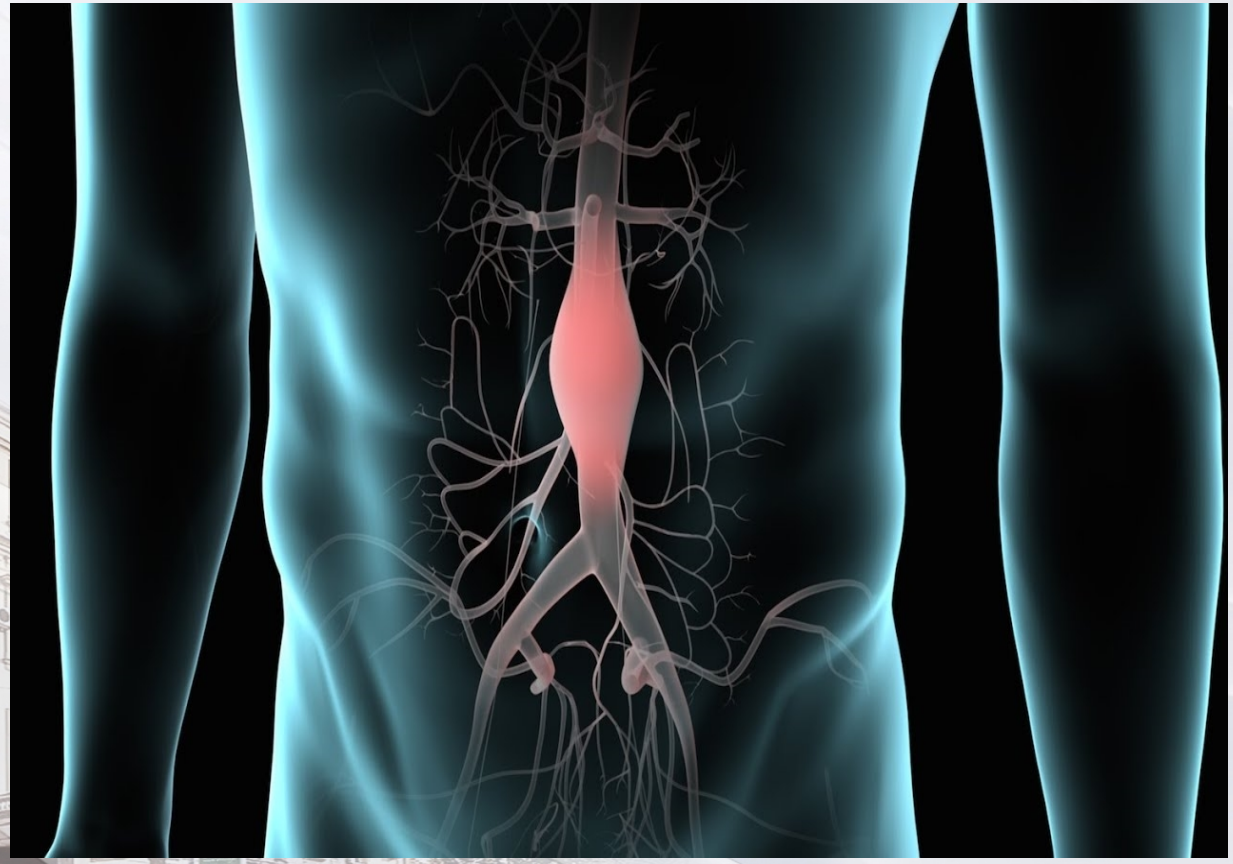
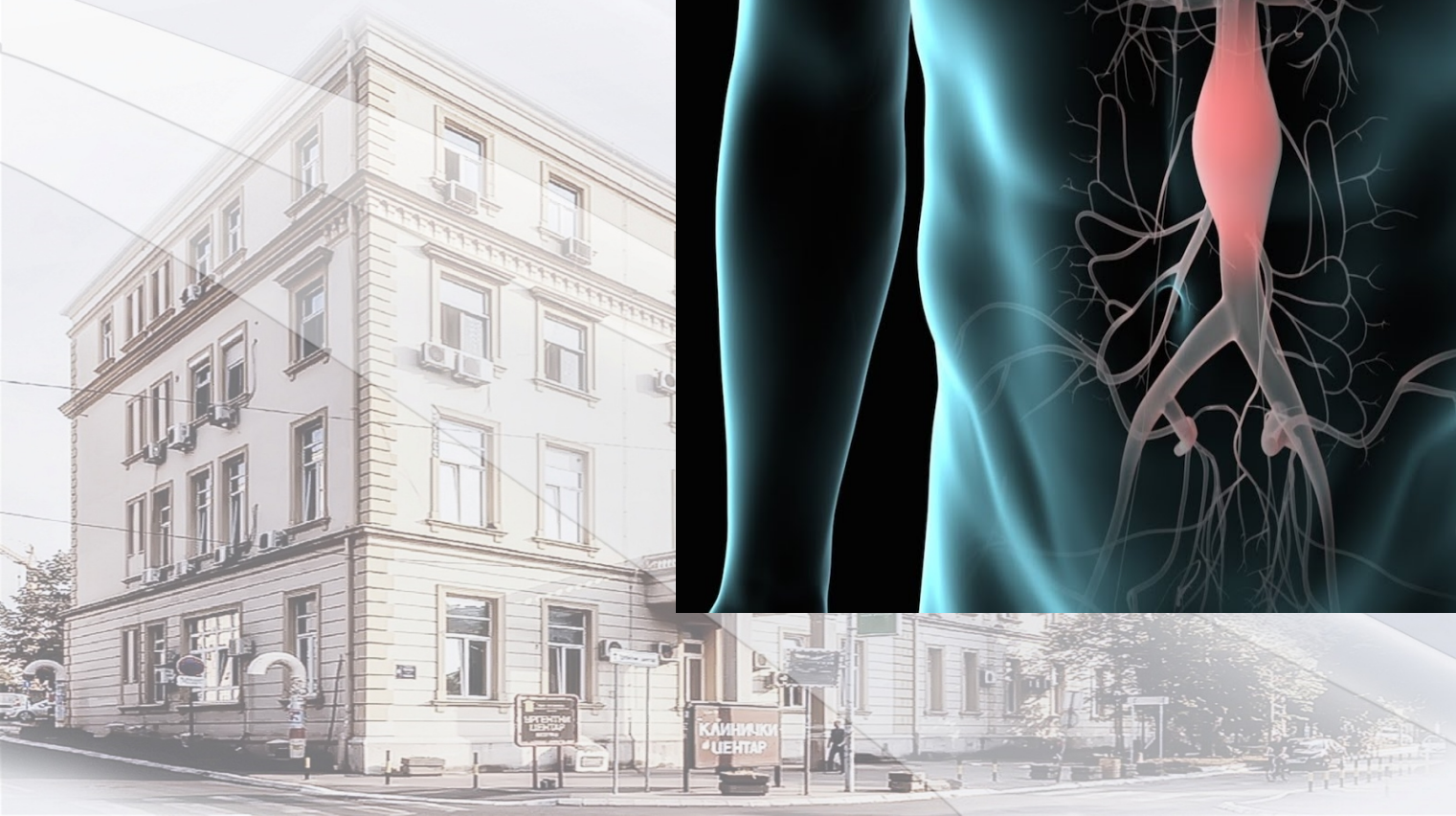
THANK YOU FOR YOUR ATTENTION





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