

# 5<sup>TH</sup> AZERBAIJAN INTERVENTIONAL CARDIOLOGY MEETING

12-14 October 2023

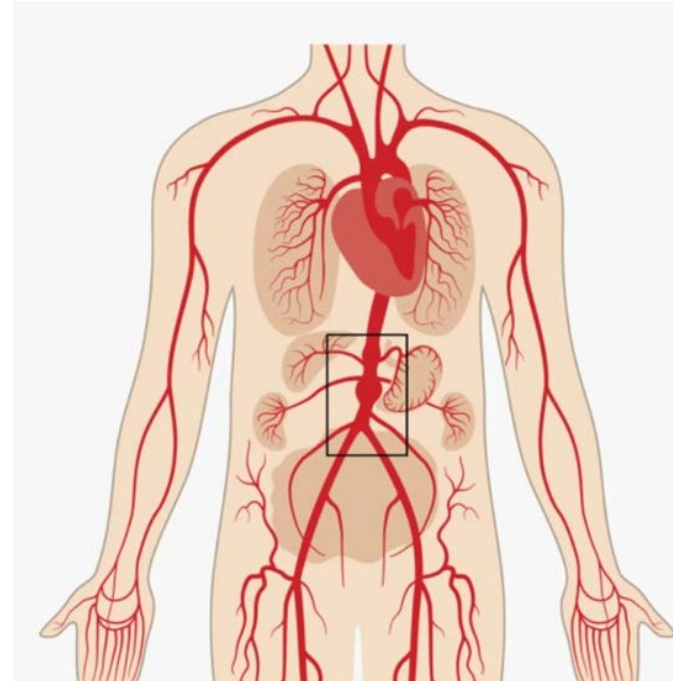
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## Overview of Abdominal Aortic Aneurysm

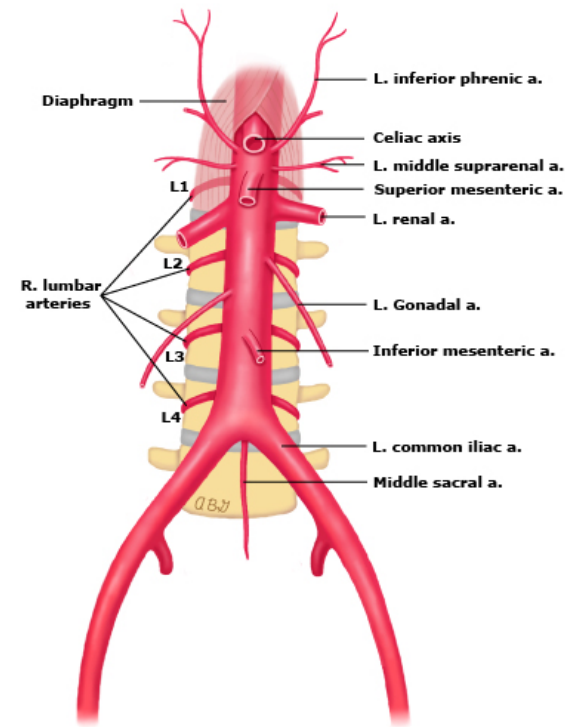
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Kardiyoloji A.D.



## DEFINITIONS

- Abdominal aortic aneurysm (AAA) definition: abdominal aortic diameter > 3.0cm
- Main risk of aortic aneurysm: rupture



# PATHOPHYSIOLOGY & RISK FACTORS

## PATHOPHYSIOLOGY

- Normal remodeling requires balance between proteases (that break down tissue) and their inhibitors
- AAA: imbalance between proteases and inhibitors
  - Increase in inflammatory cytokines: IL-1B and TNF- $\alpha$
  - Cytokines  $\rightarrow$  increase matrix metalloproteinases (MMPs)
  - MMPs take over and destruct collagen and elastin in the ECM  $\rightarrow$  thinning of aortic wall  $\rightarrow$  dilation and aneurysm

## RISK FACTORS for AAA

Smoking

Family history of AAA

Male sex

HTN

Older age

*Other large artery aneurysms  
(eg, iliac, femoral, popliteal)*

HT, Atherosclerosis

- There is a decreased risk of AAA in DM
  - Diabetics have a thicker aorta  $\rightarrow$  decreases wall stress

## CLINICAL PRESENTATIONS

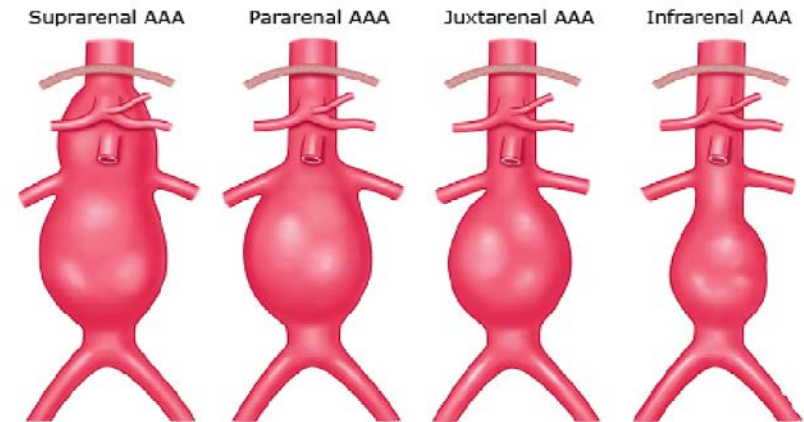
- Asymptomatic
  - MOST COMMON
  - Found incidentally on imaging for another cause or preventative maintenance surveillance for smoking history
- Symptomatic
  - Fast expansion → pain
  - Compression/Erosion into surrounding structures - mostly in inflammatory
    - Ureteral compression → hydronephrosis and flank pain
    - Bowel (rare)
      - Aortoenteric fistula → hematemesis or hematochezia
      - Small bowel obstruction
- Rupture
  - Triad of severe pain, hypotension and pulsatile abdominal mass
  - Diagnosis missed initially up to 30% of the time



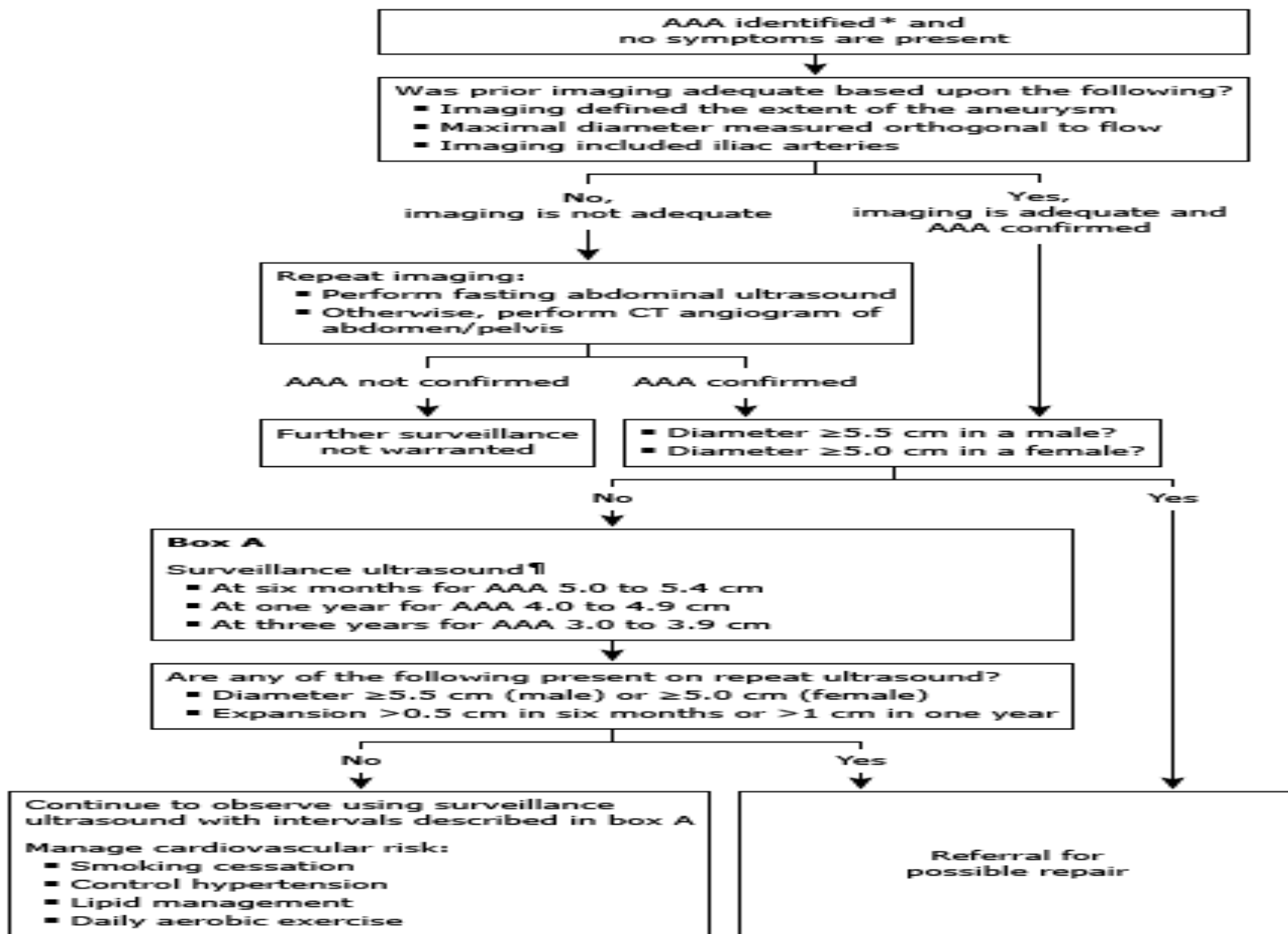
Aort

## SIZE / LOCATION CLASSIFICATION

- Small aneurysms have a diameter <4.0 cm
- Medium aneurysms have a diameter between 4.0 and 5.5 cm
- Large aneurysms have a diameter >5.5 cm
- Very large aneurysms have a diameter  $\geq 6.0$  cm

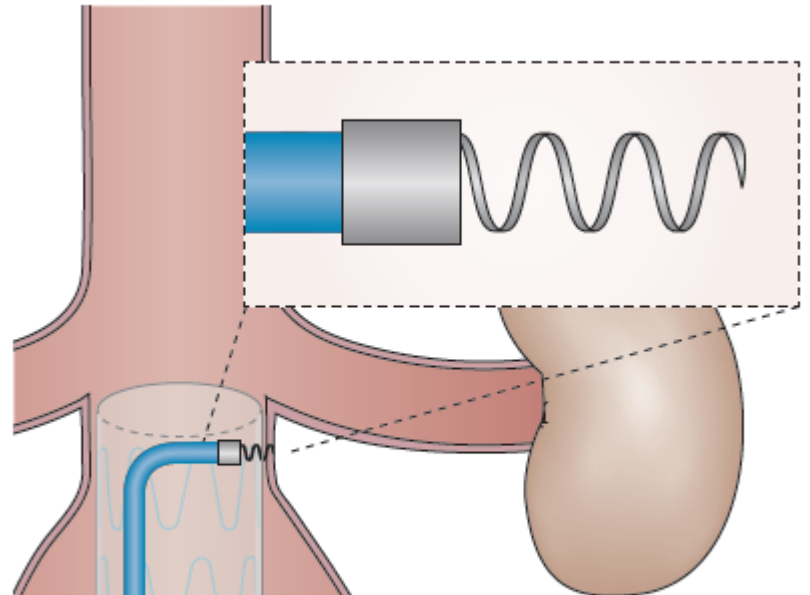
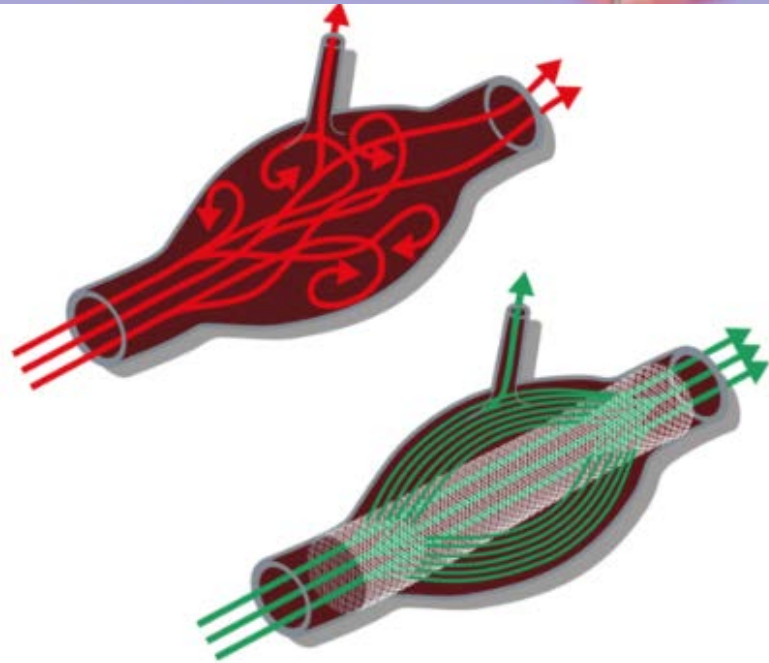
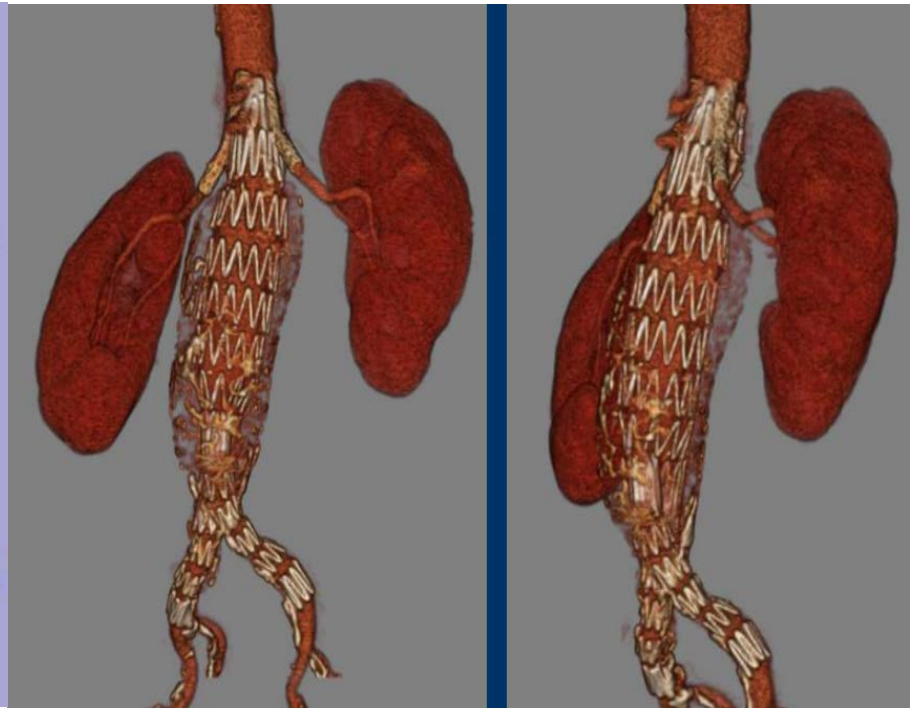
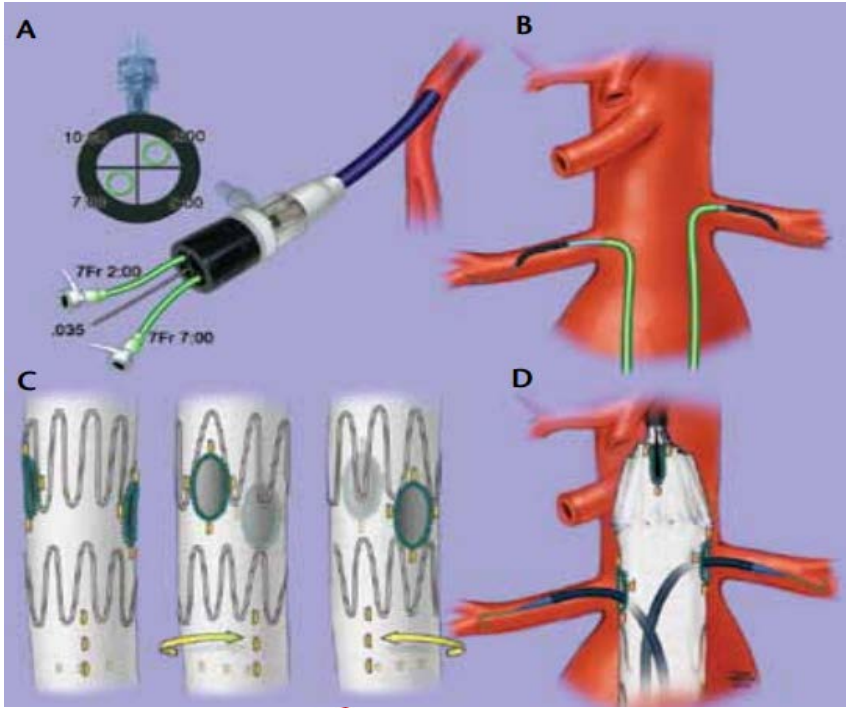


# Diagnosis and management of asymptomatic abdominal aortic aneurysm



## MEDICAL MANAGEMENT

- Appropriate for small aneurysms and non-operative candidates
- There is a lack of RCTs and formal guidelines looking at risk reduction for AAAs
- Smoking cessation
  - Reduces all-cause mortality
  - Reduction in aneurysm-related mortality
- Reduction of cardiovascular risk factors
  - Statin therapy recommended in all patients with AAA
    - No RCT data
    - A small study showed Simvastatin reduced MMP levels in aortic wall by 40%
  - Antiplatelet therapy with low-dose aspirin recommended to reduce overall cardiovascular risk





# SURGICAL MANAGEMENT - OPEN VERSUS ENDOVASCULAR REPAIR - TRIAL DATA

- OVERALL CONCLUSIONS
  - EVAR (endovascular aortic repair) associated with lower immediate post-operative morbidity and mortality
  - OSR (open surgical repair) associated with decreased long-term morbidity and mortality
  - Open repair preferred for good surgical candidates
- 2013 meta-analysis of 25,078 EVAR patients and 27,142 OSR patients
  - Lower 30-day mortality with EVAR
  - Same 2-year all-cause mortality (EVAR, 3586 of 25 078 [14.3%]; OSR, 4071 of 27 142 [15.2%]; odds ratio, 0.87 [95% CI, 0.72-1.06];  $P = .17$ )
  - *More EVAR patients required re-intervention and had late aneurysm rupture*
- DREAM trial (Dutch trial comparing open and endovascular repair)
  - Similar 12-year survival rate (OSR, 41.7%; EVAR, 38.4%; 3.3% difference [95% CI, -7.1% to 13.7%];  $P = .48$ )
  - Higher *freedom from* re-intervention for OSR (OSR, 86.4%; EVAR, 65.1%; 21.3% difference [95% CI, 11.2%-31.4%];  $P = .001$ )
- EVAR 1 trial
  - After 8 years, EVAR associated with higher all-cause mortality (adjusted hazard ratio, 1.25 [95% CI, 1.00-1.56])
  - After 8 years, EVAR associated with aneurysm-associated mortality (adjusted hazard ratio, 5.82 [95% CI, 1.64-20.65])

# SURGICAL MANAGEMENT – WHEN TO REPAIR

## Society for Vascular Surgery (SVS) Guidelines for AAA Treatment (Level of Evidence/Quality of Evidence Rating)

Decision to treat with elective repairs

Fusiform aneurysms of 5.5 cm or larger (1/A)

All saccular aneurysms (2/C)

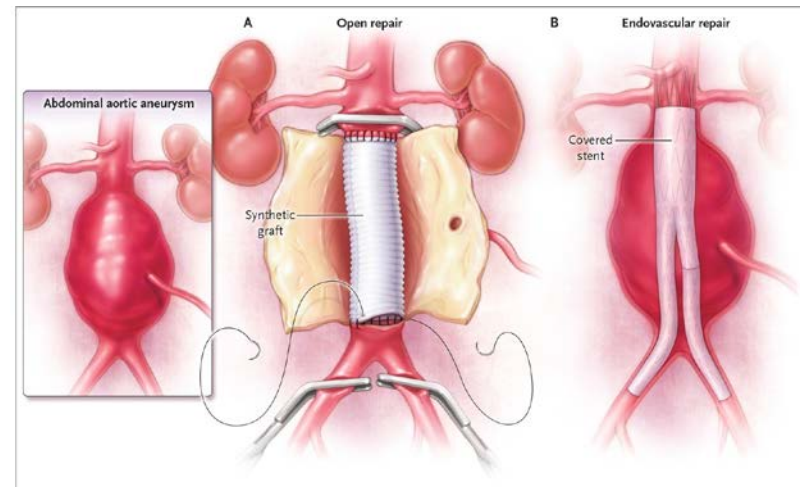
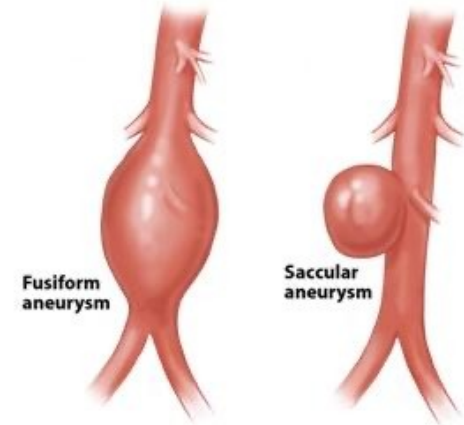
Aneurysms of 5 cm or larger in women (2/B)

Operative approach

Preserve at least 1 hypogastric artery (1/A)

Endovascular aneurysm repair recommended for ruptured AAA (1/C)

- Treatment
  - Asymptomatic aneurysms should be treated with the approach above
    - Treatment can be endovascular or open (see following slides)
    - Saccular aneurysms higher risk for rupture → treated at lower sizes
  - All symptomatic aneurysms should be treated urgently



# OPEN REPAIR

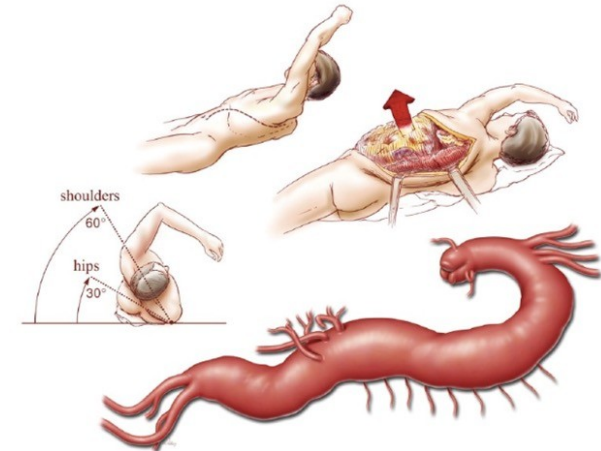
Retroperitoneal positioning and incision

- Can use transperitoneal or retroperitoneal approach
- Approach depends on exposure needed for repair and previous surgeries

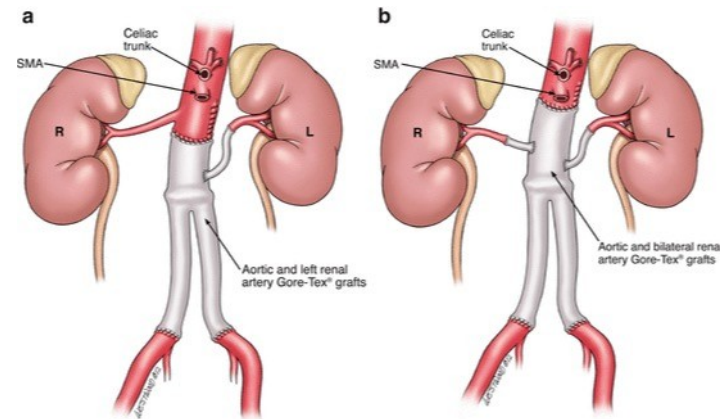
- Better view of right iliac and femorals
- Higher rates of ileus

- **Transperitoneal**

- Retroperitoneal approach
  - Better for more proximal aneurysms
  - Lower risk of ileus and pneumonia

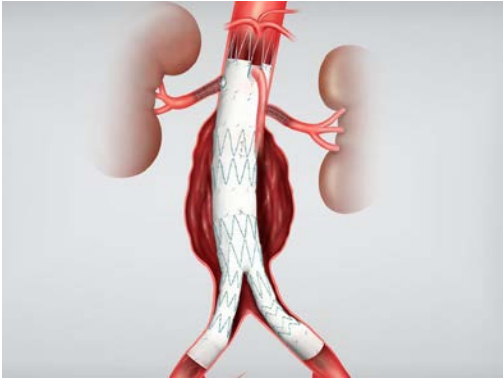


Open repair of juxtarenal aneurysm with renal bypass

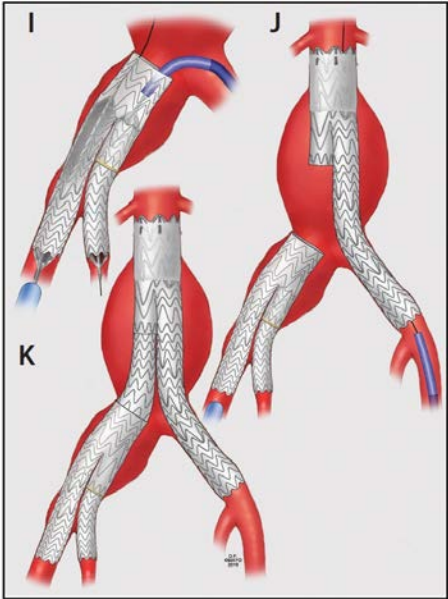


# ENDOVASCULAR REPAIR

- EVAR depends on seal in normal, non-aneurysmal, aorta and iliacs
- Need sufficient infrarenal neck or placement of stents into visceral arteries to be able to bring graft proximally into normal aorta
- Can coil hypogastric or perform a bifurcated stent graft in iliacs if needed to bring graft into normal external iliac if common iliac aneurysmal
- Need sufficient iliac and femoral diameters to deliver graft
  - Iliac conduits (cutdown on iliac arteries) can be used if small iliacs to allow graft to be delivered if more distal arteries too small

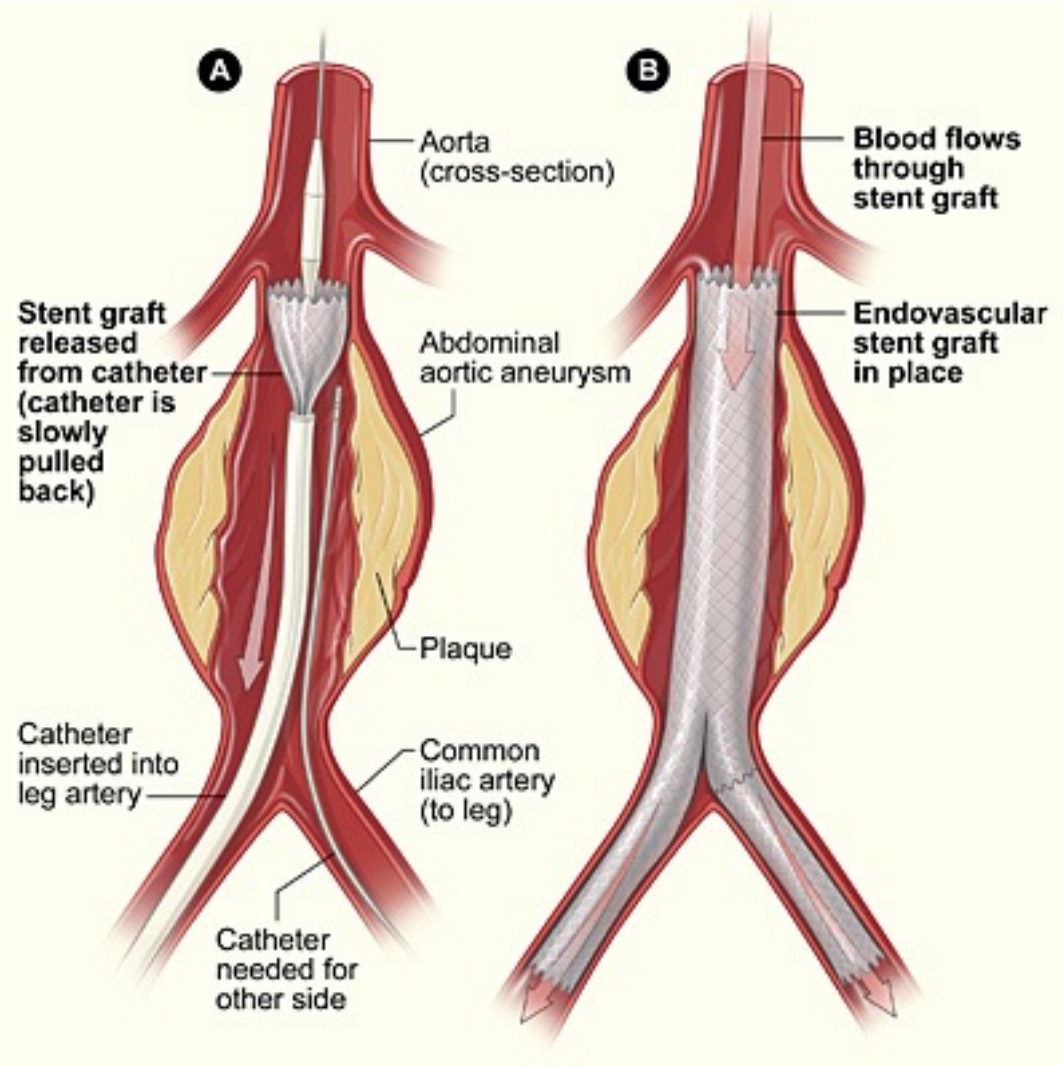


Fenestrated endograft (aka graft with holes created for placement of stents through them) with stents in the renal arteries to bring graft seal into normal aorta proximally

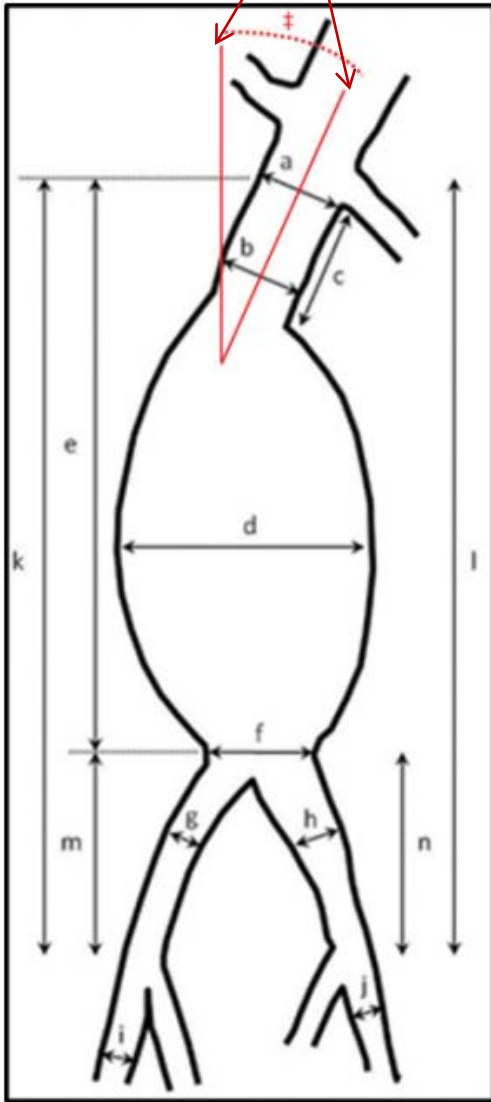


Bifurcated iliac graft and infrarenal EVAR for aneurysmal aorta and right iliac

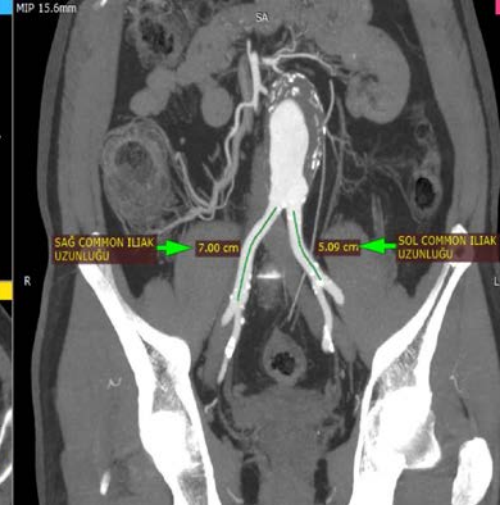
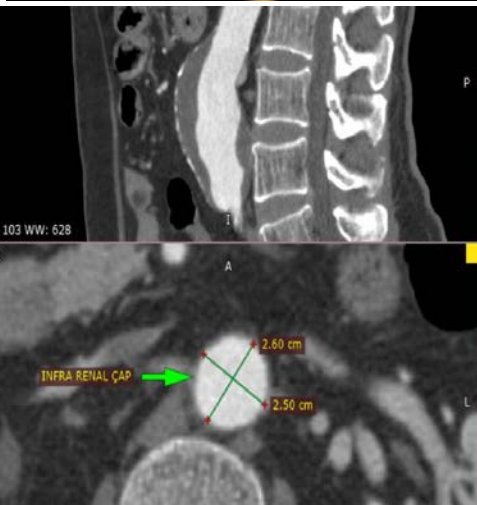
# Endovascular Aneurysm Repair (EVAR)



## Aortic neck angle



- a) Aortic neck diameter
- b) Diameter of the aortic neck 15 mm away from the renal artery closer to the aneurysm
- c) Aneurysm neck length diameter
- d) Aneurysm diameter
- e) Aortic bifurcation diameter
- f) Right common iliac artery diameter
- g) Right common iliac artery diameter
- h) Right external iliac artery diameter
- i) Left external iliac artery diameter
- j) Aneurysm to the right renal artery distance
- k) Aneurysm to the left renal artery distance
- l) Right iliac artery sealing length
- m) Left iliac artery sealing length



# ANATOMICAL CHARACTERISTIC

Favorable characteristics	Hostile characteristics
Aortic neck diameter < 30 mm	Aortic neck diameter > 30 mm
Aortic neck length > 15 mm	Aortic neck length < 15 mm
Aortic angulation < 60 degrees	Aortic angulation > 60 degrees
Aortic calcification < 50% total circumference	Aortic calcification > 50% total circumference
Absence of reverse taper morphology	Reverse taper morphology
<50% circumferential thrombus	>50% circumferential thrombus



**Table 1** | Anatomical criteria from the instructions for use for AAA endovascular devices approved by the FDA

Endovascular device	Year of FDA approval	Neck diameter (mm)	Neck length (mm)	Neck angulation (°)	Iliac neck length (mm)	Iliac neck diameter (mm)
Ancure™ (EndoVascular Technologies, Inc., USA)*	1999	18–26	≥15	NS	≥20	<13.5
AneuRx® (Medtronic Vascular, Inc., USA)	1999	18–25	≥10 <sup>†</sup>	≤45	NS	NS
Excluder® (W. L. Gore & Associates, Inc., USA)	2002	19–26	≥15	≤60	≥10	10–18.5
Zenith® (Cook Medical Technologies, USA)	2003	18–28	≥15	≤60	≥15	10–20
Low-permeability Excluder® (W. L. Gore & Associates, Inc., USA)	2004	19–26	≥15	≤60	≥10	10–18.5
Powerlink® (Endologix, Inc., USA)	2004	18–26	≥15	≤60	≥15	8–18
Enlarged-neck Zenith® (Cook Medical Technologies, USA)	2006	18–32	≥15	≤60	≥15	10–20
Talent® (Medtronic Vascular, Inc., USA)	2008	18–32	≥10	≤60	≥15	8–22
Enlarged-neck Powerlink® (Endologix Inc., USA)	2009	18–32	≥15	≤60	≥15	10–23
Enlarged-neck Excluder® (W. L. Gore & Associates, Inc., USA)	2009	19–29	≥15	≤60	≥10	10–18.5
Endurant® (Medtronic Vascular, Inc., USA)	2010	19–32	≥10	≤60	≥15	8–25
Ovation® (Trivascular, Inc, USA)	2011	15.5–30	≥7	45–60	≥10	8–20
Fenestrated Zenith® (Cook Medical Technologies, USA)	2012	19–31	≥4	<45	>30	7–21
Aorfix® (Lombard Medical, UK)	2013	19–29	≥15	≤90	≥15	9–19

\*Device discontinued in 2003. <sup>†</sup>Changed to ≥15 mm in 2003. Abbreviations: AAA, abdominal aortic aneurysm; NS, not specified.

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Teşekkürler