

# ENDOVASKULÁRNÍ LÉČBA ONEMOCNĚNÍ AORTY

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# **1991 Juan Carlos Parodi**



# Background

- Endovascular repair (EVAR) has become the method of choice for repair of AAA and TAAA
- RCT comparing EVAR and open repair for infra-renal AAA
  - Superior perioperative and mid-term outcome
  - Better QoL 6 m. postprocedure
  - Long-term outcome comparable
  - EVAR associated with surveillance and secondary intervention

*EVAR 1 trial. Lancet 2016, 388:2366-74*

*DREAM trial. NEJM 2004, 351(16):1607-18*

*OVER trial. JAMA 2009, 302(14):1535-42*

# Background

- Up to 60% EVARs are complex cases due to difficult aneurysmal neck anatomy
  - Length (<15mm, no neck AAA)
  - Angulation (>60°)
  - Calcification (>50%)
  - Thrombus (50%)
  - Diameter (>32mm)
  - Reverse taper morphology

# Aortic neck angulation predicts adverse outcome with endovascular abdominal aortic aneurysm repair

W. Charles Sternbergh III, MD,<sup>a</sup> Glen Carter, RT (R)(CV),<sup>a</sup> John W. York, MD,<sup>a</sup> Moises Yoselevitz, MD,<sup>b</sup> and Samuel R. Money, MD, MBA,<sup>a</sup> *New Orleans, La*

*Conclusion:* Aortic neck angulation appears to be an important determinant of outcome after EAAA repair. Although patients with mild angulation (<40 degrees) had favorable outcomes in this series, those with moderate (40 to 59 degrees) or severe angulation ( $\geq 60$  degrees) had a 54% to 70% risk of one or more adverse events. Importantly, these outcomes occurred in spite of an adequate length (>2 cm) of proximal aortic neck. On the basis of these data, great caution should be exercised in recommending EAAA repair for patients with aortic neck angulation  $\geq 40$  degrees. (J Vasc Surg 2002;35:482-6)

# Influence of severe infrarenal aortic neck angulation on complications at the proximal neck following endovascular abdominal aortic aneurysm repair

Roel Hobo, Jur Kievit, Lina J. Leurs, and Jacob Buth

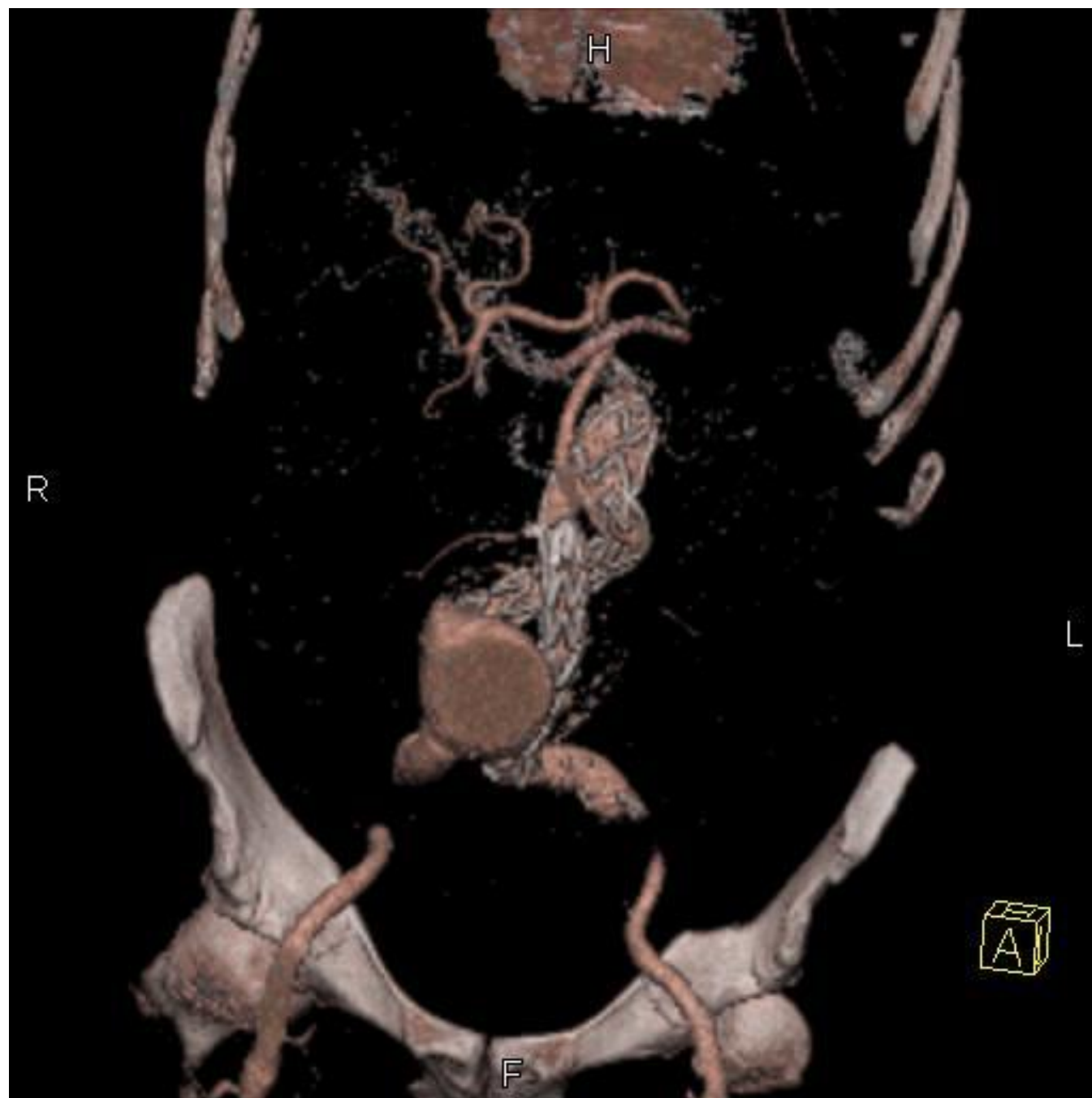
*J Endovasc Ther 2007;14:1-11.*

## SHORT-TERM RESULTS FOR NECK ANGULATION >60°

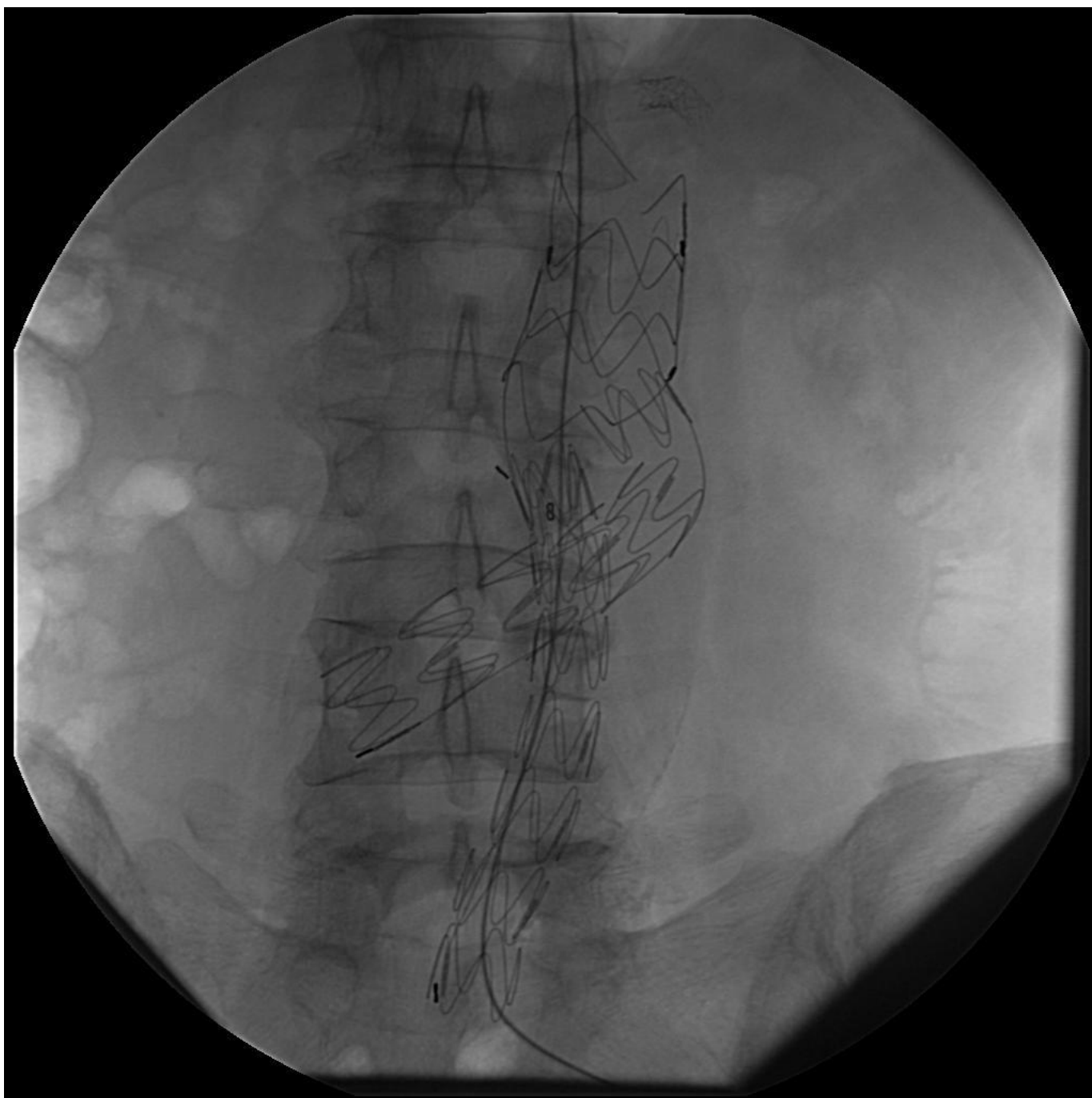
|                        | <b>Present<br/>(n=1152)</b> | <b>Absent<br/>(n=4031)</b> | <b>Adjusted*<br/>Odds Ratio</b> | <b>95% CI</b> | <b>p</b> |
|------------------------|-----------------------------|----------------------------|---------------------------------|---------------|----------|
| Proximal endoleak      | 4.9%                        | 1.9%                       | 2.32                            | 1.60 to 3.37  | <0.0001  |
| Stent-graft migration  | 1.6%                        | 0.8%                       | 2.17                            | 1.20 to 3.91  | 0.0105   |
| Aortic rupture         | 0.26%                       | 0.02%                      | 6.44                            | 0.64 to 64.59 | NS       |
| Secondary intervention | 3.1%                        | 2.6%                       | 0.96                            | 0.64 to 1.43  | NS       |
| Mortality              | 4.0%                        | 2.9%                       | 0.89                            | 0.62 to 1.30  | NS       |

# LONG-TERM RESULTS FOR NECK ANGULATION >60°

|                               | <b>Present<br/>(n=1152)</b> | <b>Absent<br/>(n=4031)</b> | <b>Adjusted*<br/>Hazard Ratio</b> | <b>95% CI</b> | <b>p</b> |
|-------------------------------|-----------------------------|----------------------------|-----------------------------------|---------------|----------|
| Proximal neck dilatation      | 50.1%                       | 46.8%                      | 1.26                              | 1.11 to 1.43  | 0.0004   |
| Proximal type I endoleak      | 6.5%                        | 3.2%                       | 1.80                              | 1.25 to 2.58  | 0.0016   |
| Stent-graft migration         | 5.9%                        | 4.3%                       | 1.25                              | 0.79 to 1.98  | NS       |
| Rupture                       | 2.1%                        | 1.7%                       | 1.51                              | 0.68 to 3.34  | NS       |
| Secondary intervention        | 13.6%                       | 10.8%                      | 1.29                              | 1.00 to 1.67  | 0.0488   |
| All-cause mortality           | 24.1%                       | 23.6%                      | 0.87                              | 0.72 to 1.04  | NS       |
| Aneurysm-related<br>mortality | 6.8%                        | 4.7%                       | 1.02                              | 0.75 to 1.38  | NS       |













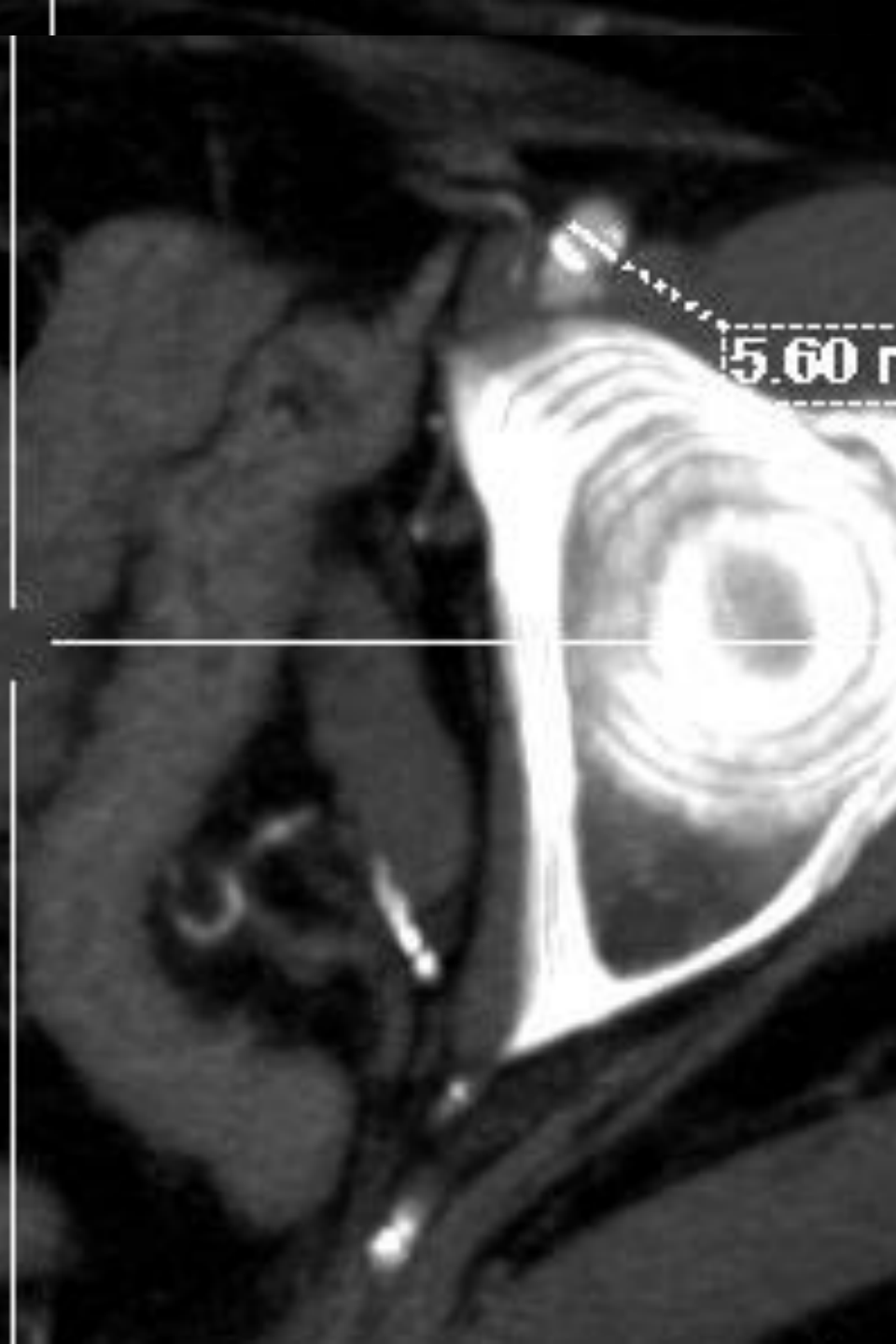
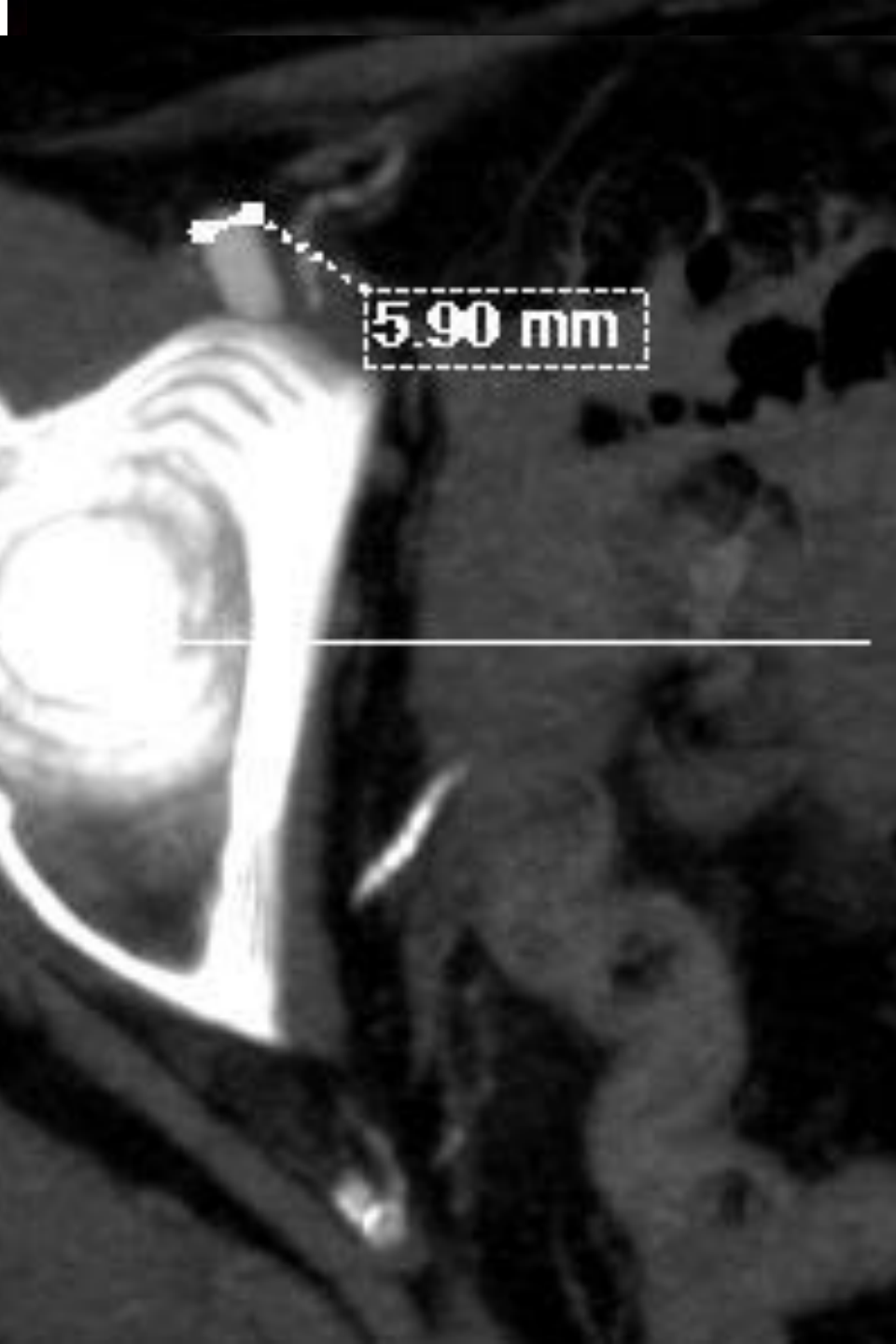






# OTHER IMPLANTATION CHALLENGE

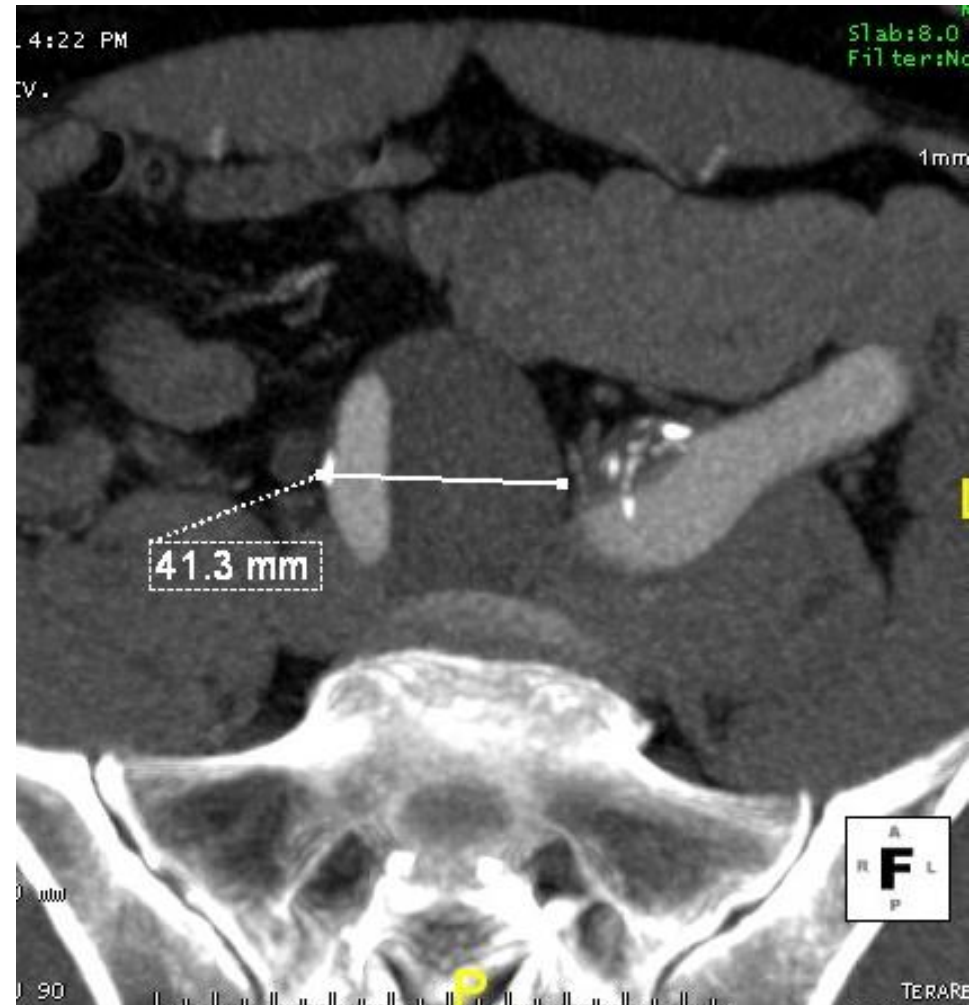
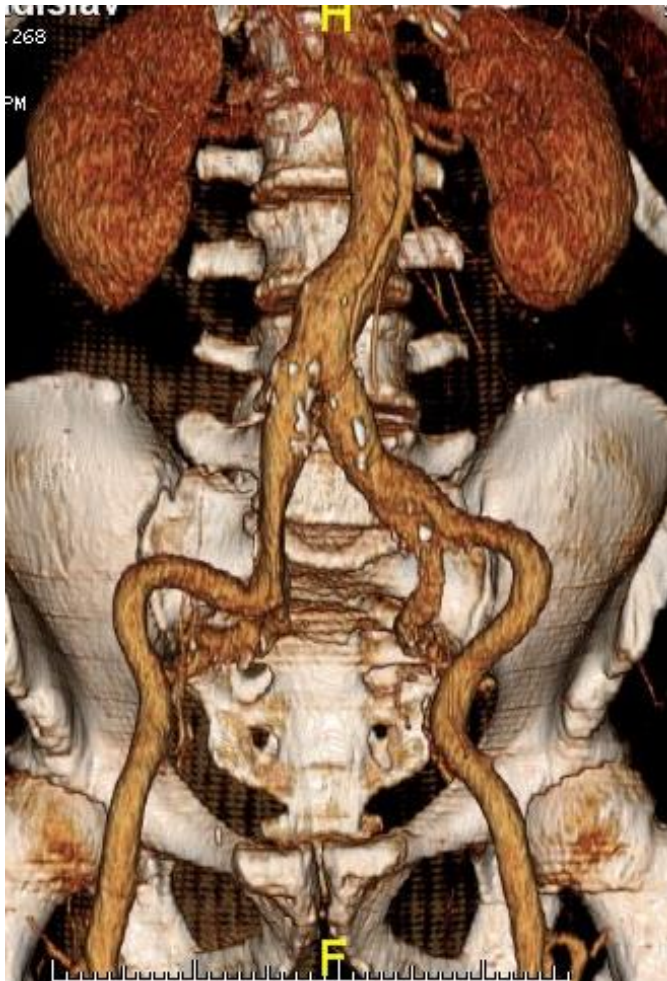
- Access vessel limitation
  - Tortuosity
  - Aneurysms
  - Tight iliacs with circular calcification
- Saving necessary branches
  - Hypogastric (double-barrel, iliac branch)
  - Renals, SMA (chimney, fenestrated, branch)



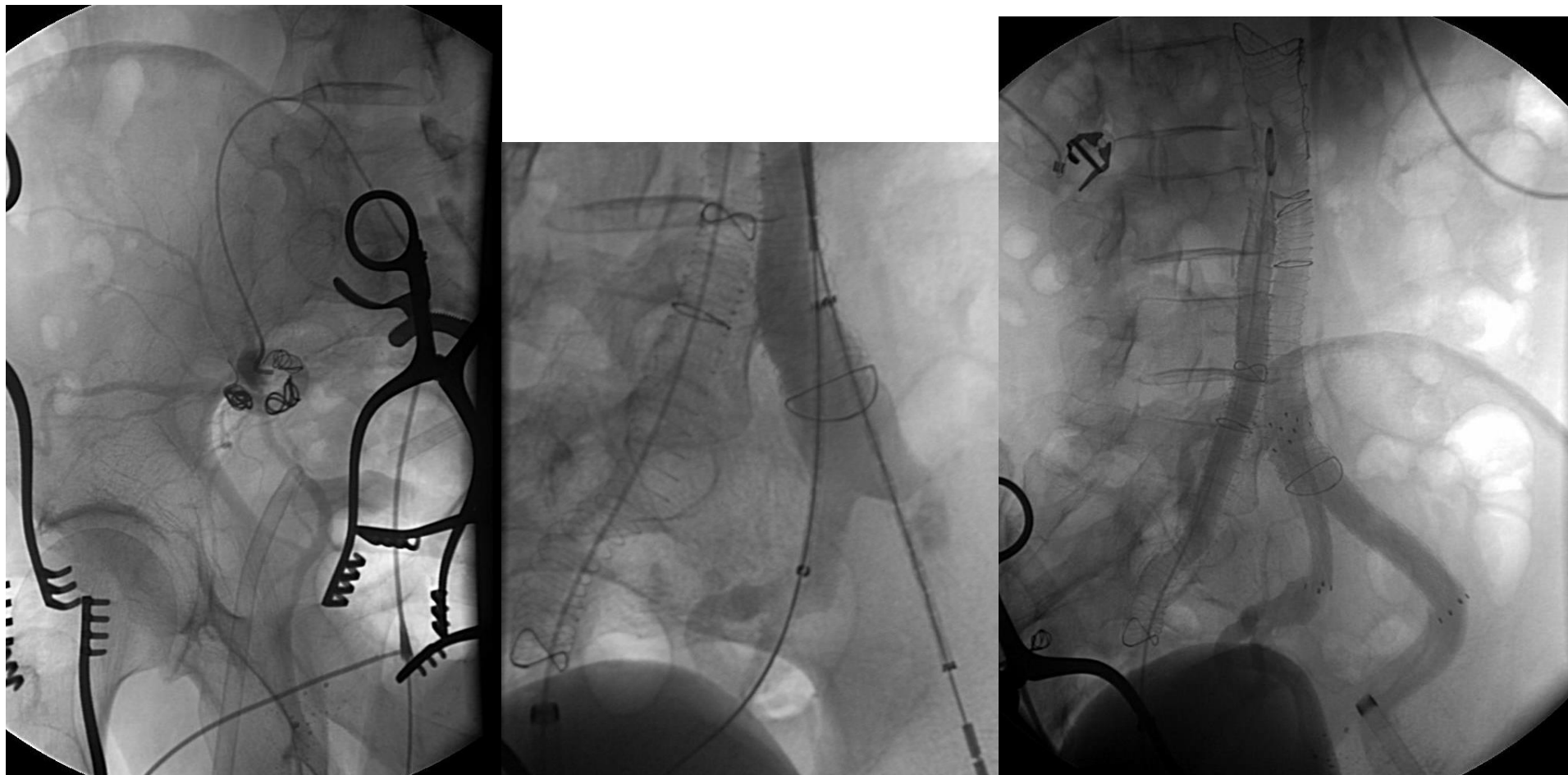


# Male 50 yr

## AAA + bilateral common iliacs aneurysm



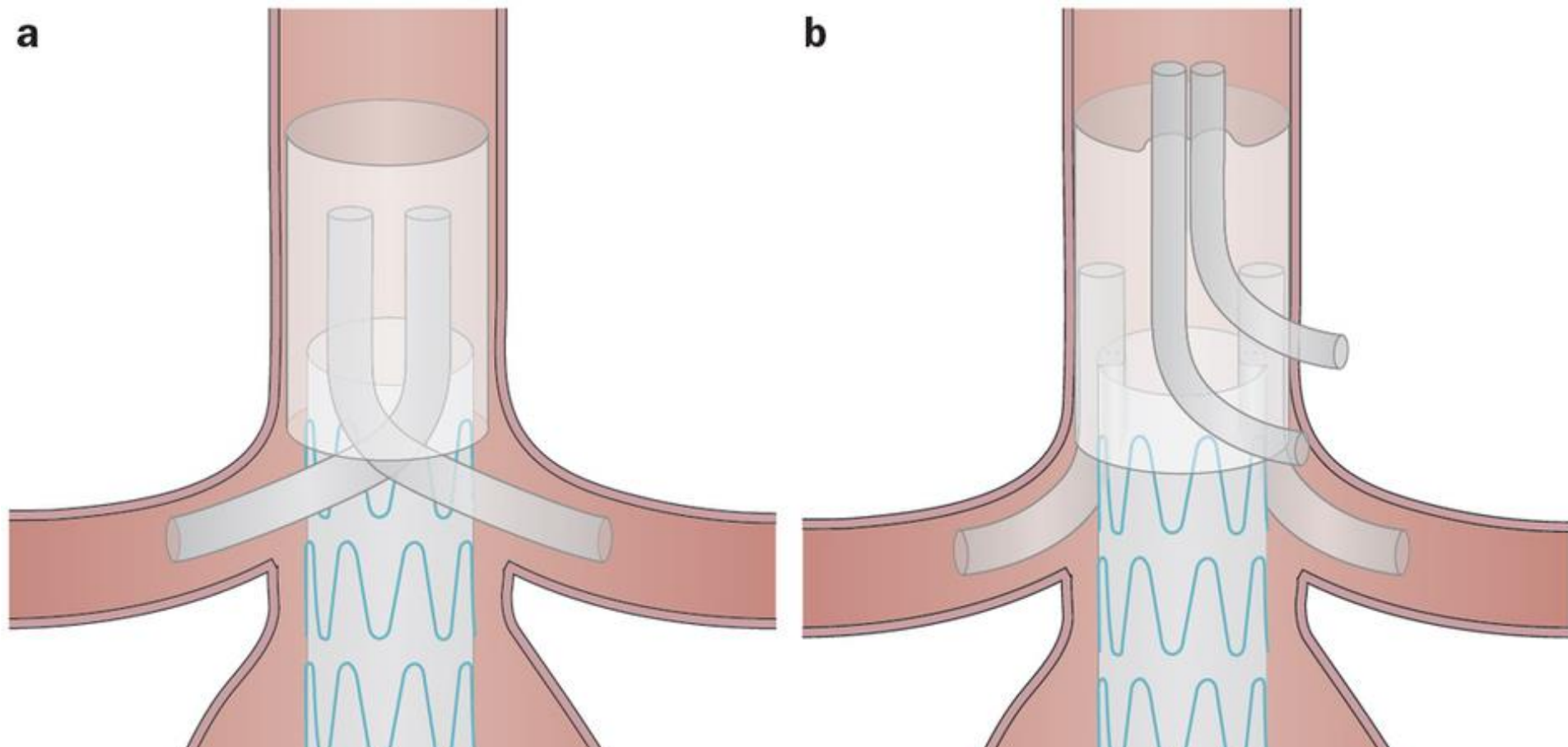
# Left hypogastric artery preservation (double barrel technique)



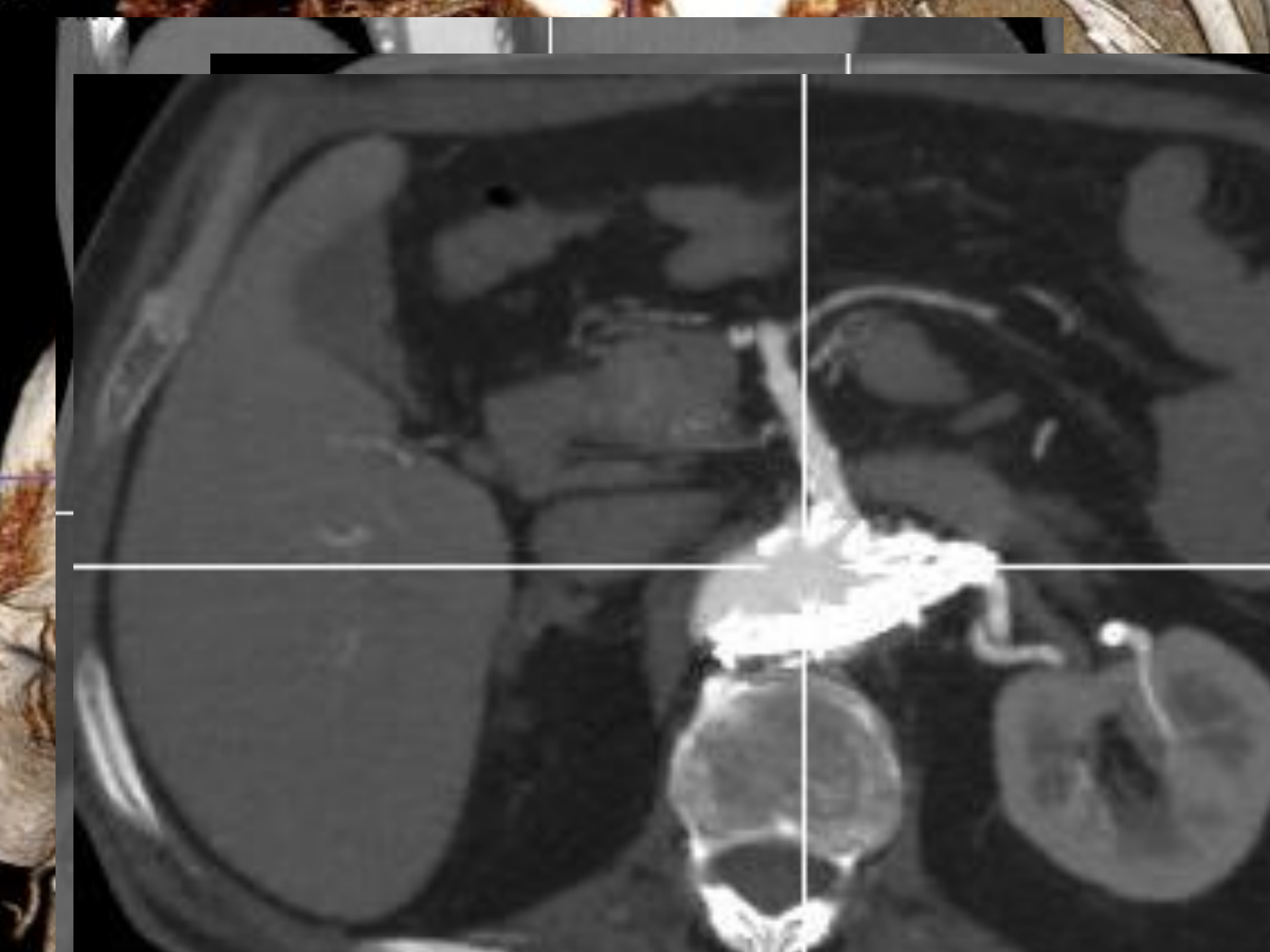
# COMPLEX EVAR IN UNFAVOURABLE NECK

- Chimney or Snorkel technique
- Hybrid procedure (visceral debranching and endovascular placement of the stentgraft)
- Fenestration and Branch technique
  - fEVAR – fenestrated stentgraft
  - bEVAR – branch stentgraft (T-Branch stentgraft)

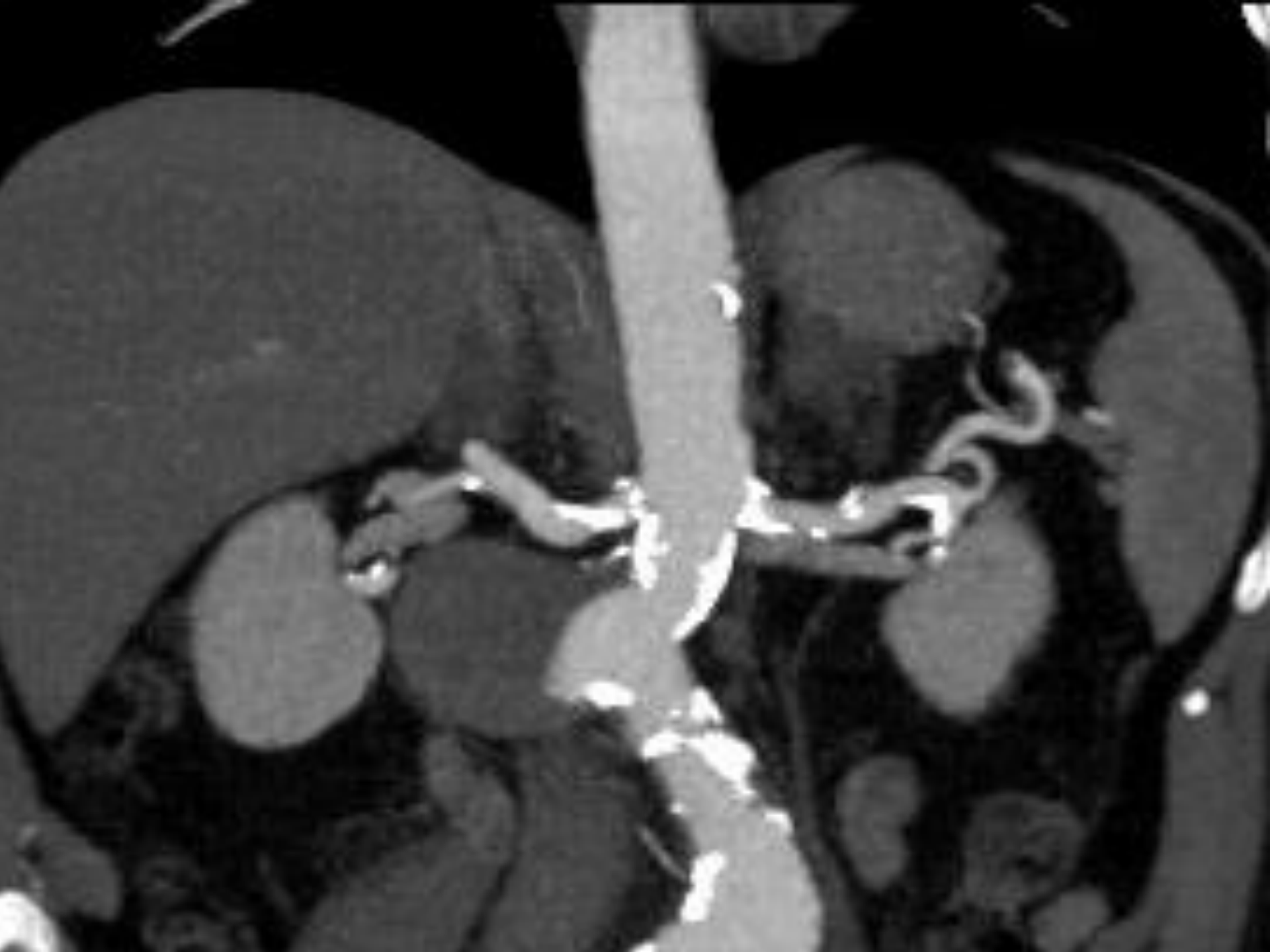
- Placement of parallel stents or stentgrafts adjacent to main body stentgraft
- Maintain perfusion to renal and visceral branches after aneurysm exclusion

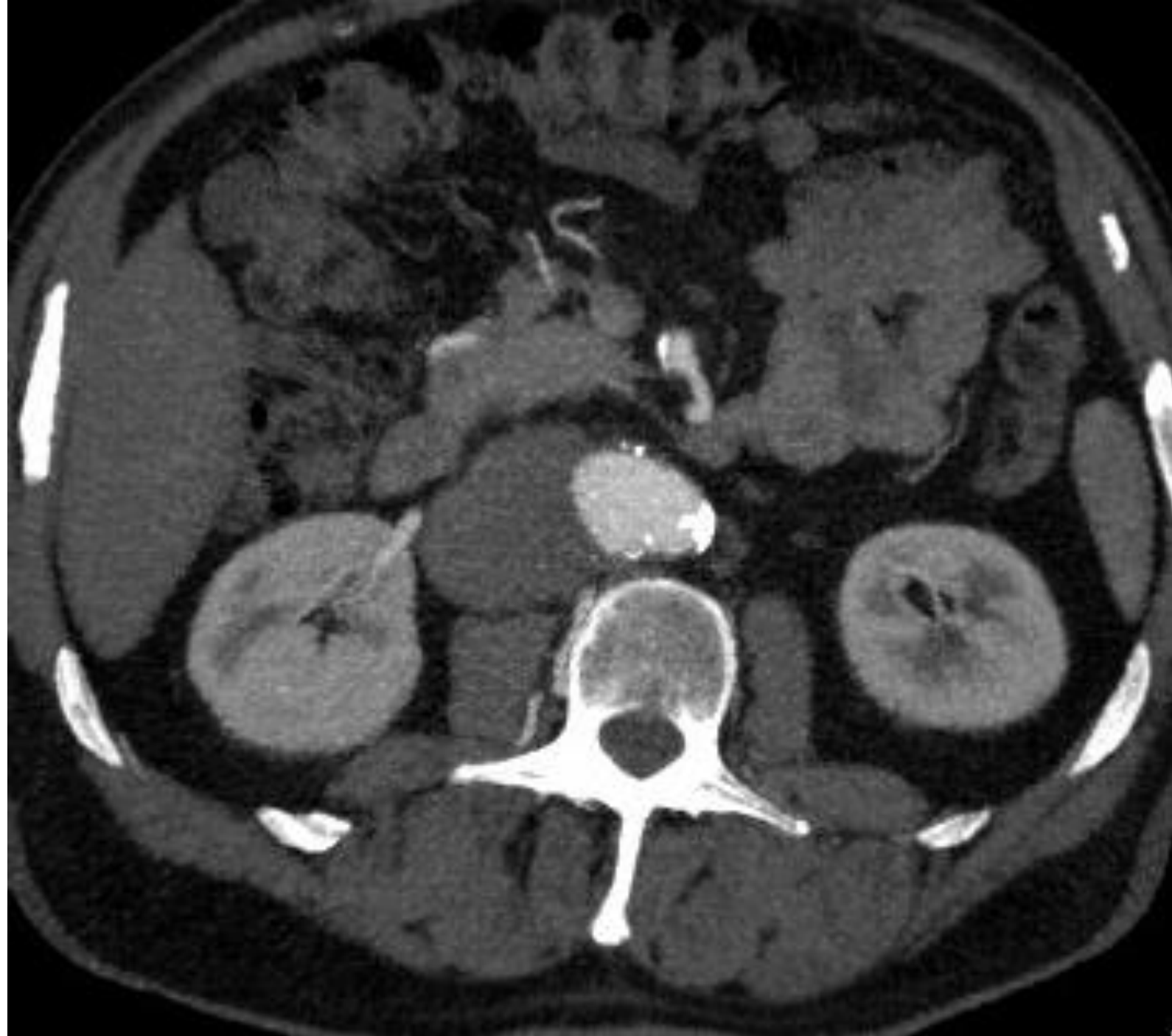






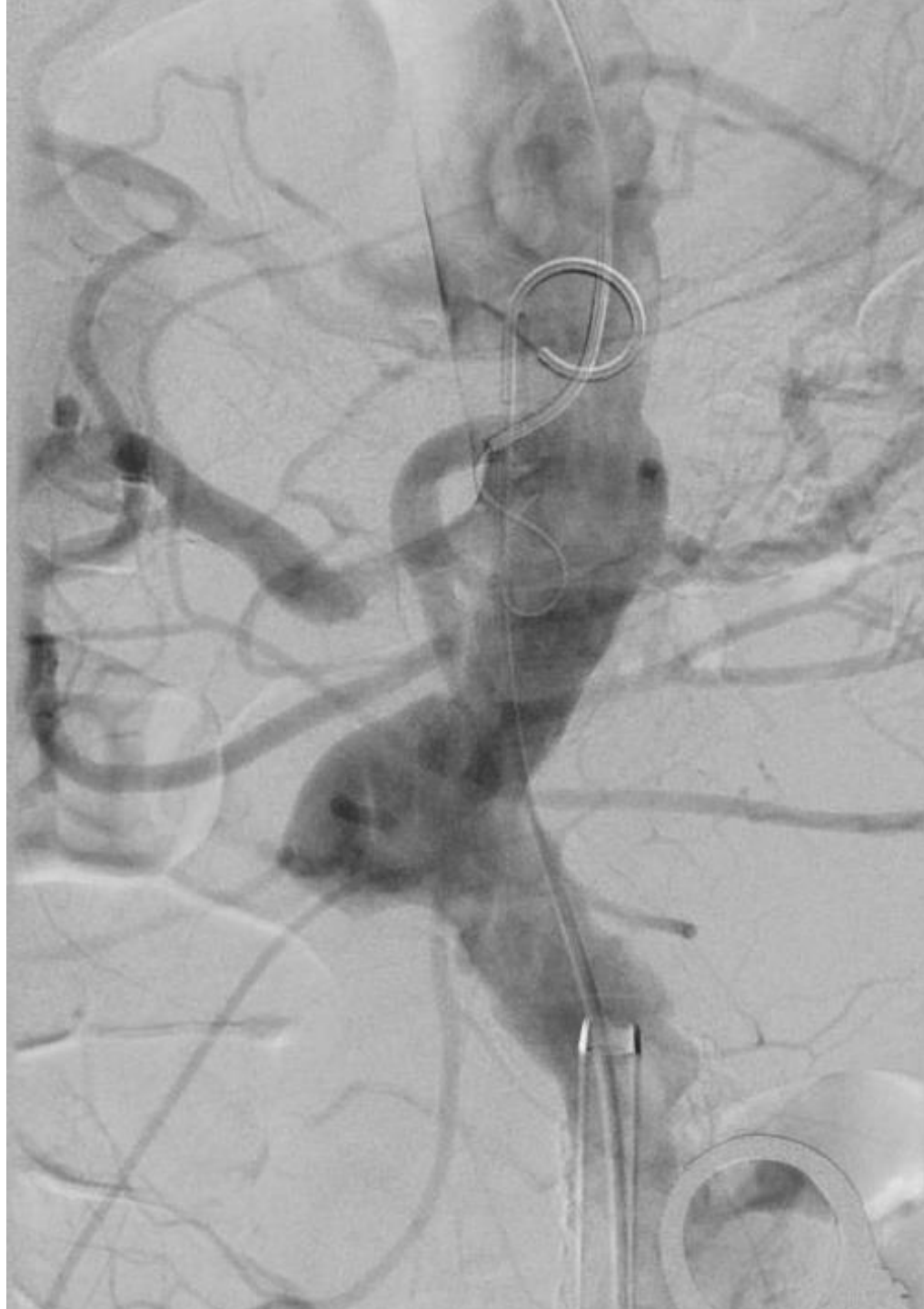








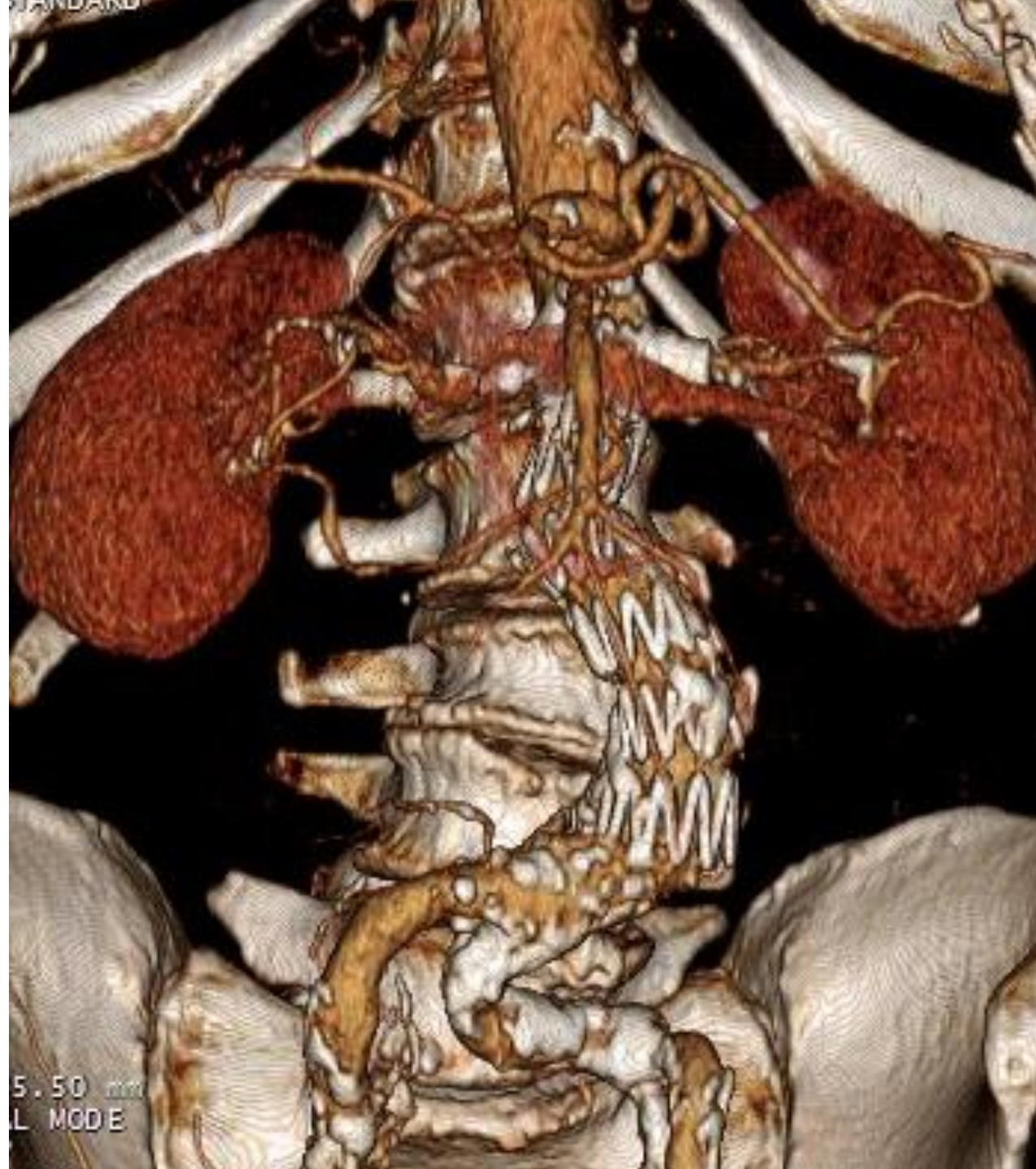






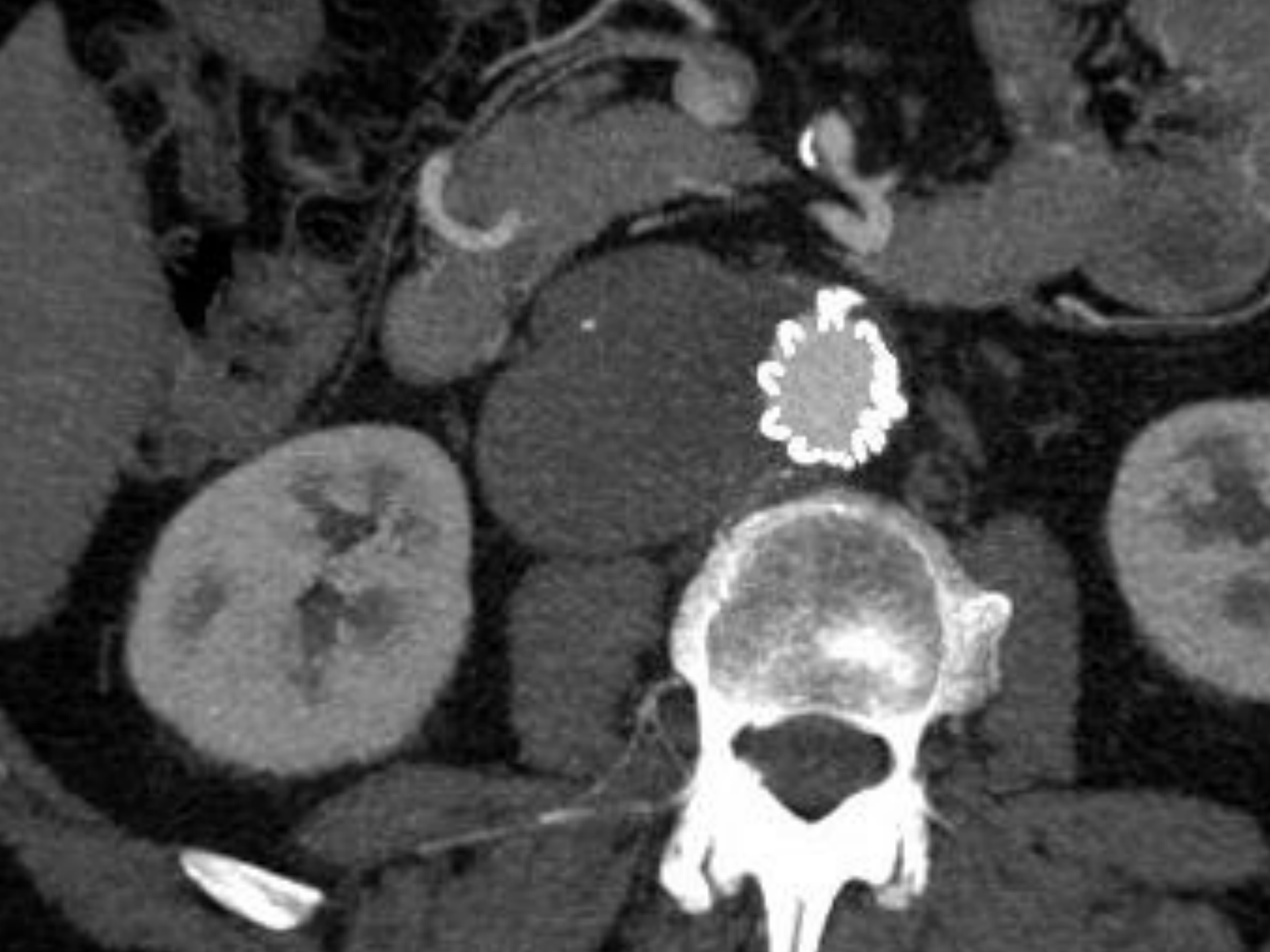








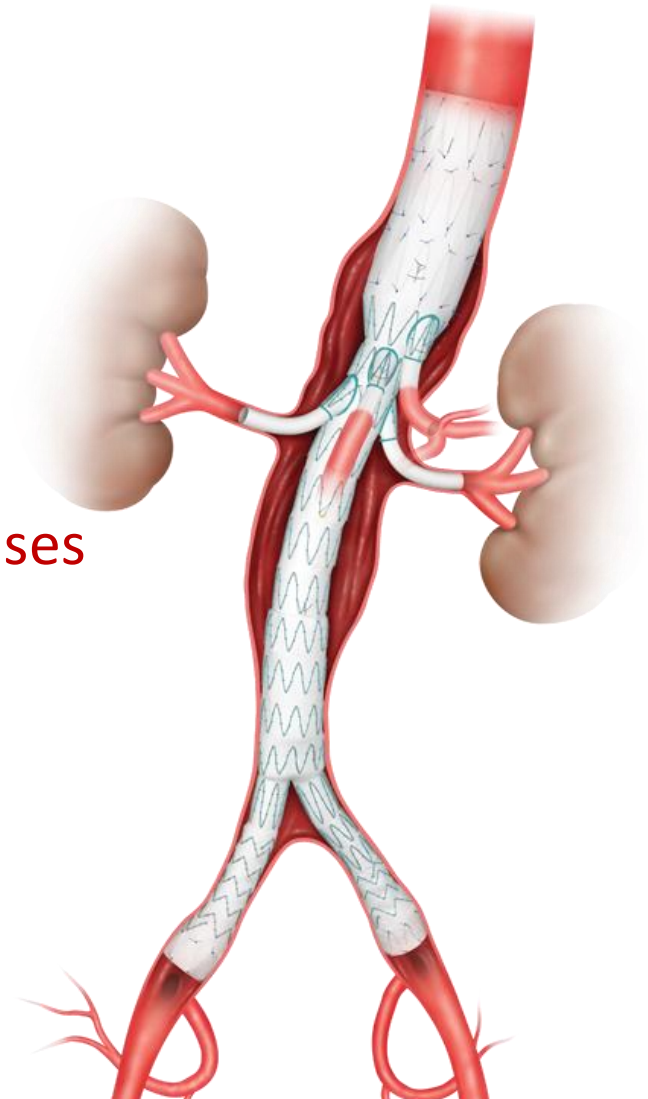




mm  
E



# Fenestrated and Branch stentgraft

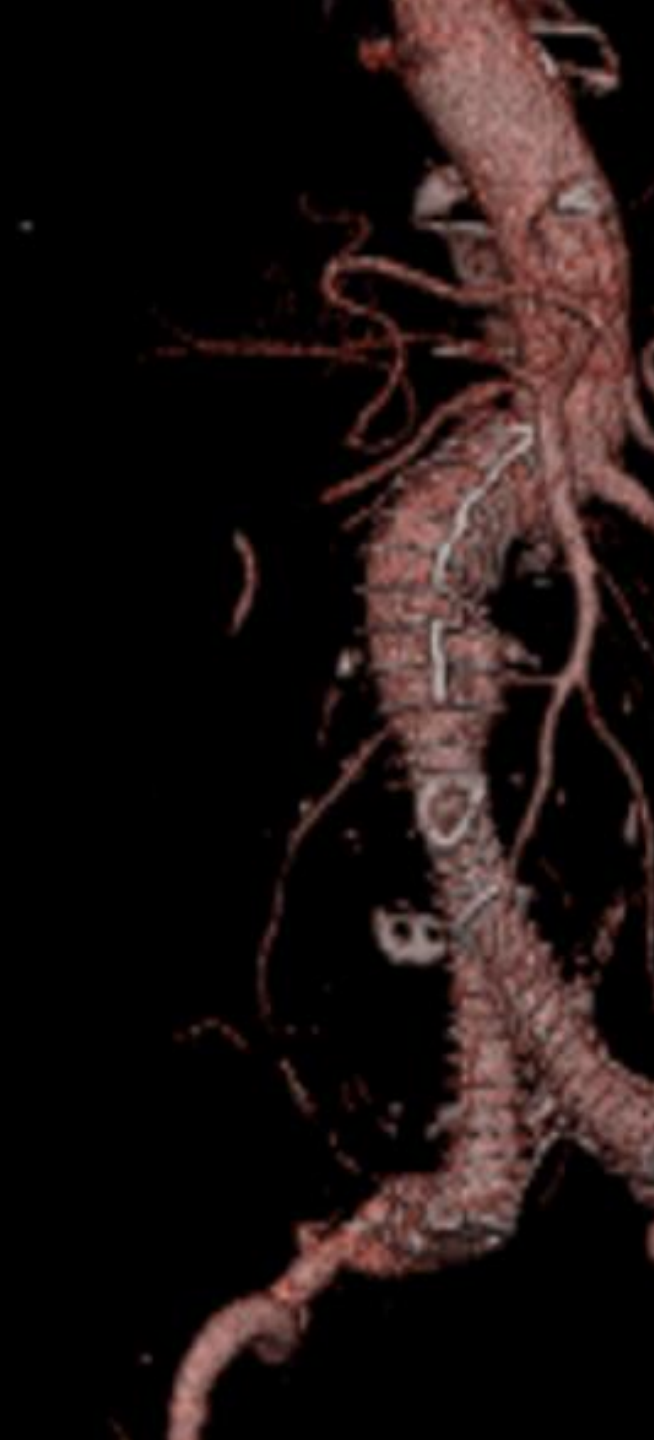












, CAROLAN

D:340129465

19 10:03 AM

ST



# Aorfix™ stentgraft

- Total number of Aorfix cases
  - N=149 (12 females)



# AAA and procedure characteristics

| Parameter                            | Mean $\pm$ SD                      | Range           |
|--------------------------------------|------------------------------------|-----------------|
| <b><i>AAA related parameters</i></b> |                                    |                 |
| Maximal diameter (mm)                | <b>65,0 <math>\pm</math> 11,7</b>  | <b>35 - 110</b> |
| Neck diameter (mm)                   | <b>24,6 <math>\pm</math> 2,2</b>   | <b>21 - 30</b>  |
| Neck lenght (mm)                     | <b>27,6 <math>\pm</math> 19,6</b>  | <b>10 - 100</b> |
| Neck angle (degrees)                 | <b>39,5 <math>\pm</math> 25,4</b>  | <b>4 - 93</b>   |
| Iliac arteries diameter (mm)         | <b>18.7 <math>\pm</math> 14.1</b>  | <b>9 - 93</b>   |
| <b><i>Stentgraft parameters</i></b>  |                                    |                 |
| Lenght (mm)                          | <b>105.1 <math>\pm</math> 10.0</b> | <b>81 - 126</b> |
| Main body diameter (mm)              | <b>27.6 <math>\pm</math> 2.3</b>   | <b>24 - 31</b>  |

# Clinical outcomes

## 8 years follow-up

- Primary procedure success n = 61 (100%)
- Immediate procedure-related complications
  - Femoro-femoral by-pass n = 2
  - PTA/stenting of the proximal neck n = 1
  - Right renal artery stenting n = 1

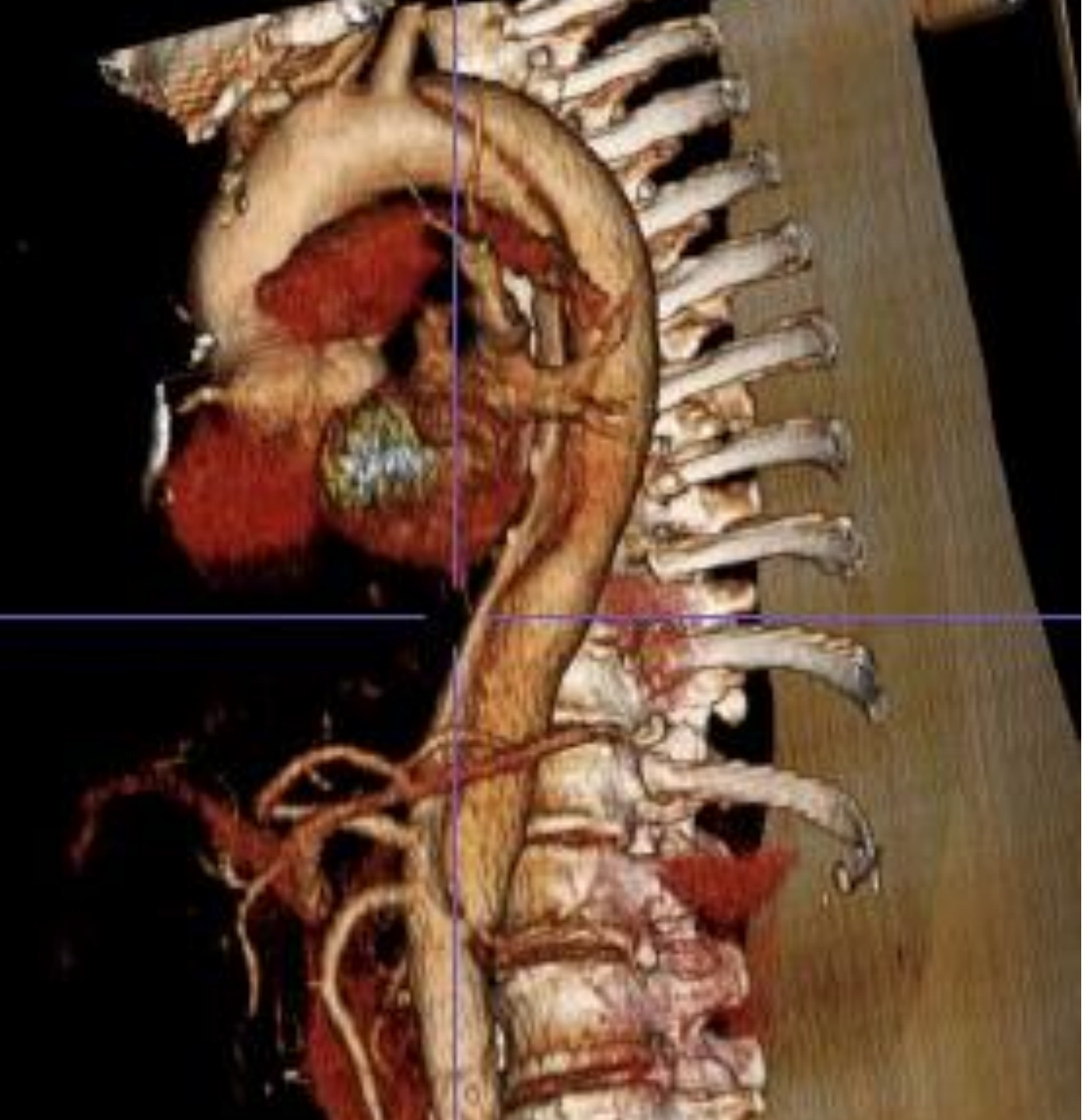
**N = 4  
6.6%**
- Reinterventions
  - reEVAR + fem-fem by-pass (90 mo) n = 1
  - stenting of the proximal neck (4 mo) n = 1

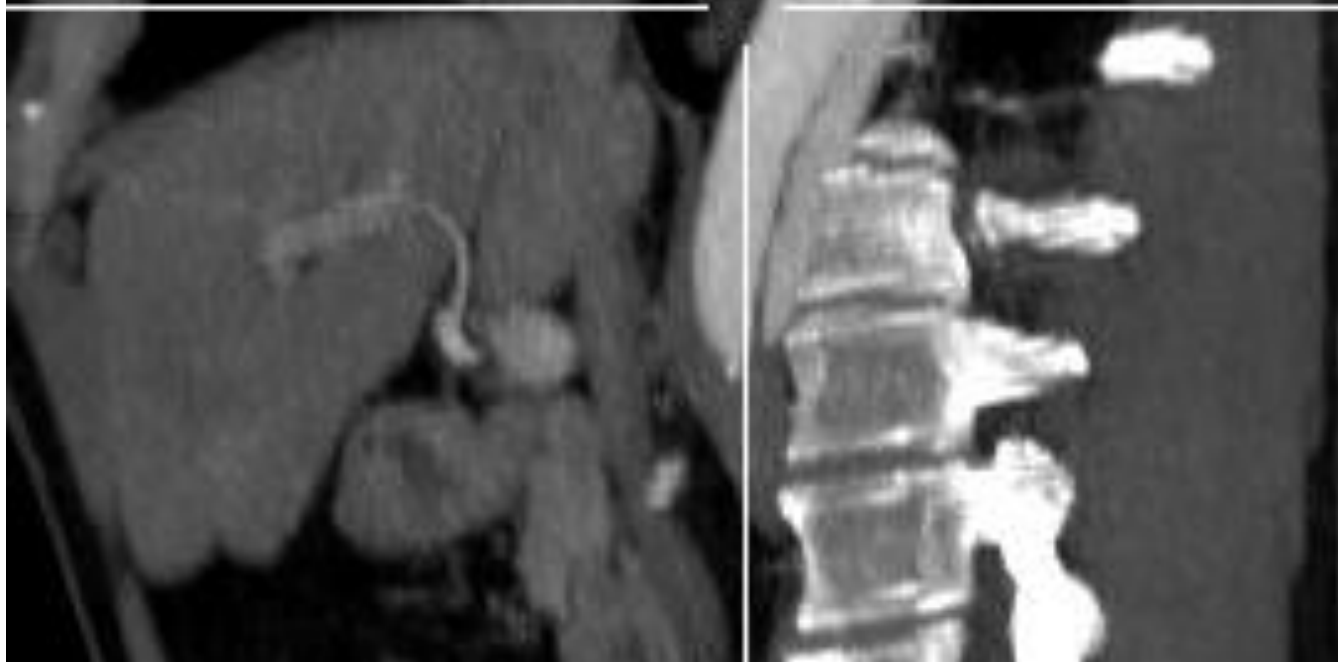
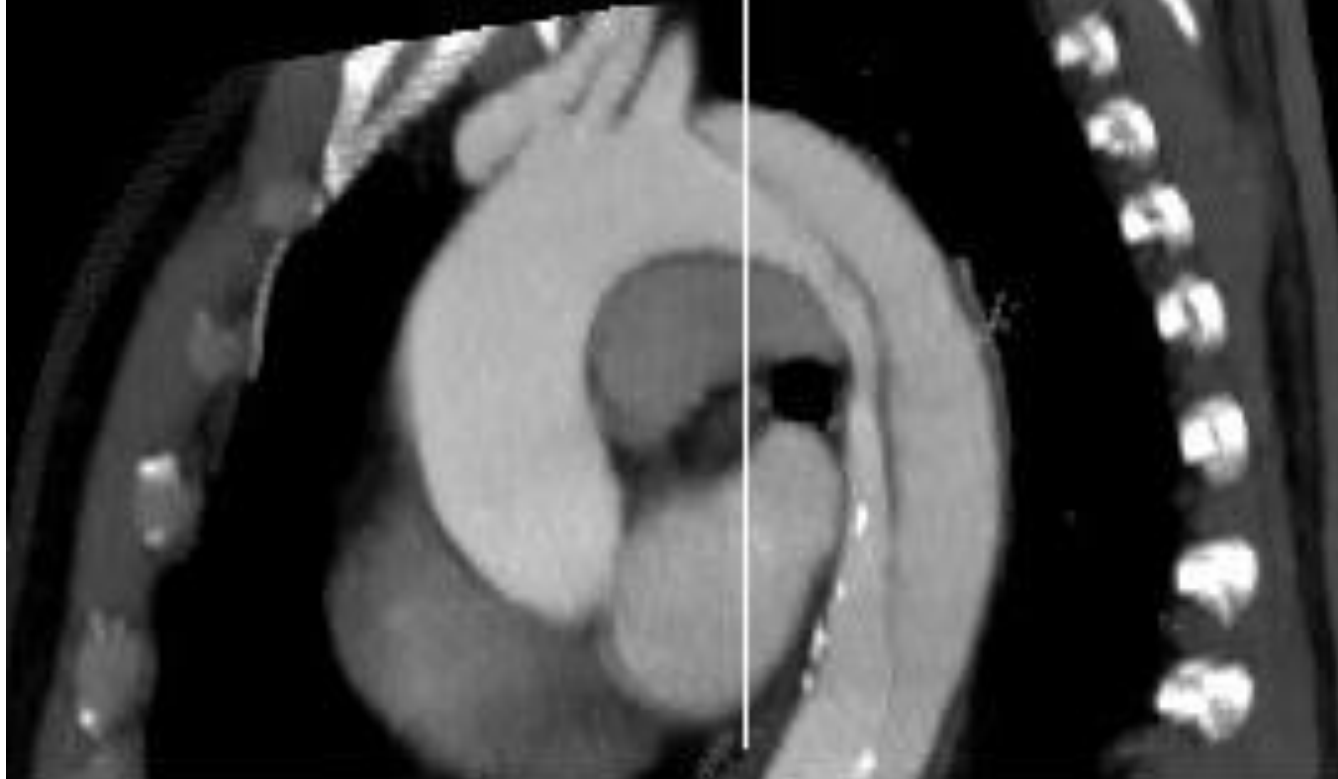
**N = 2  
3.3%**
- Aneurysm related death
  - Aneurysm rupture (68 mo) n = 1

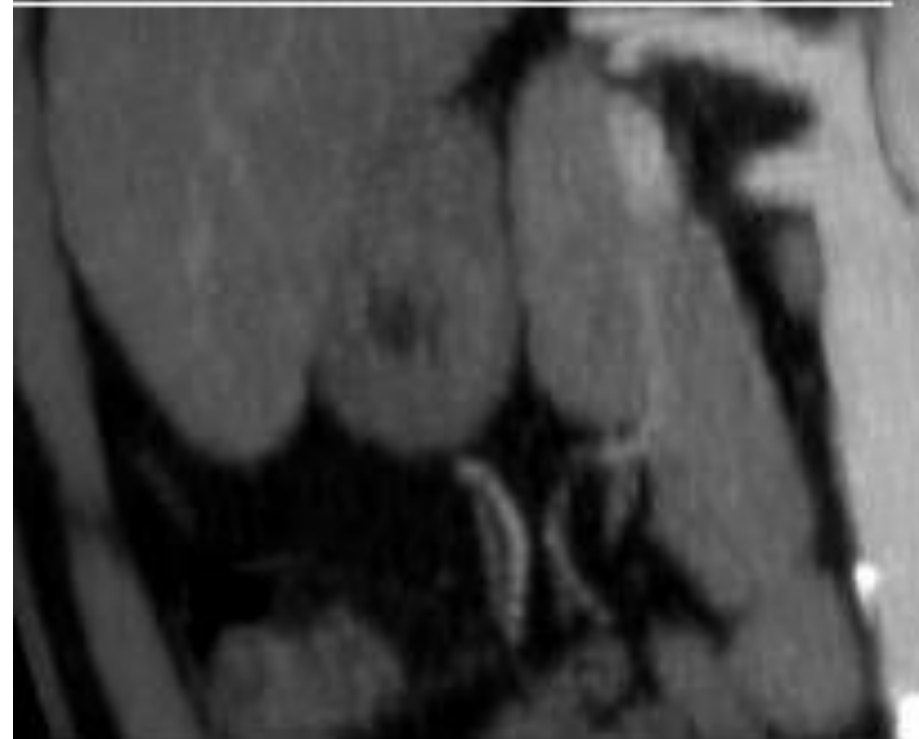
**N = 1  
1.7%**

# **CONCLUSION**

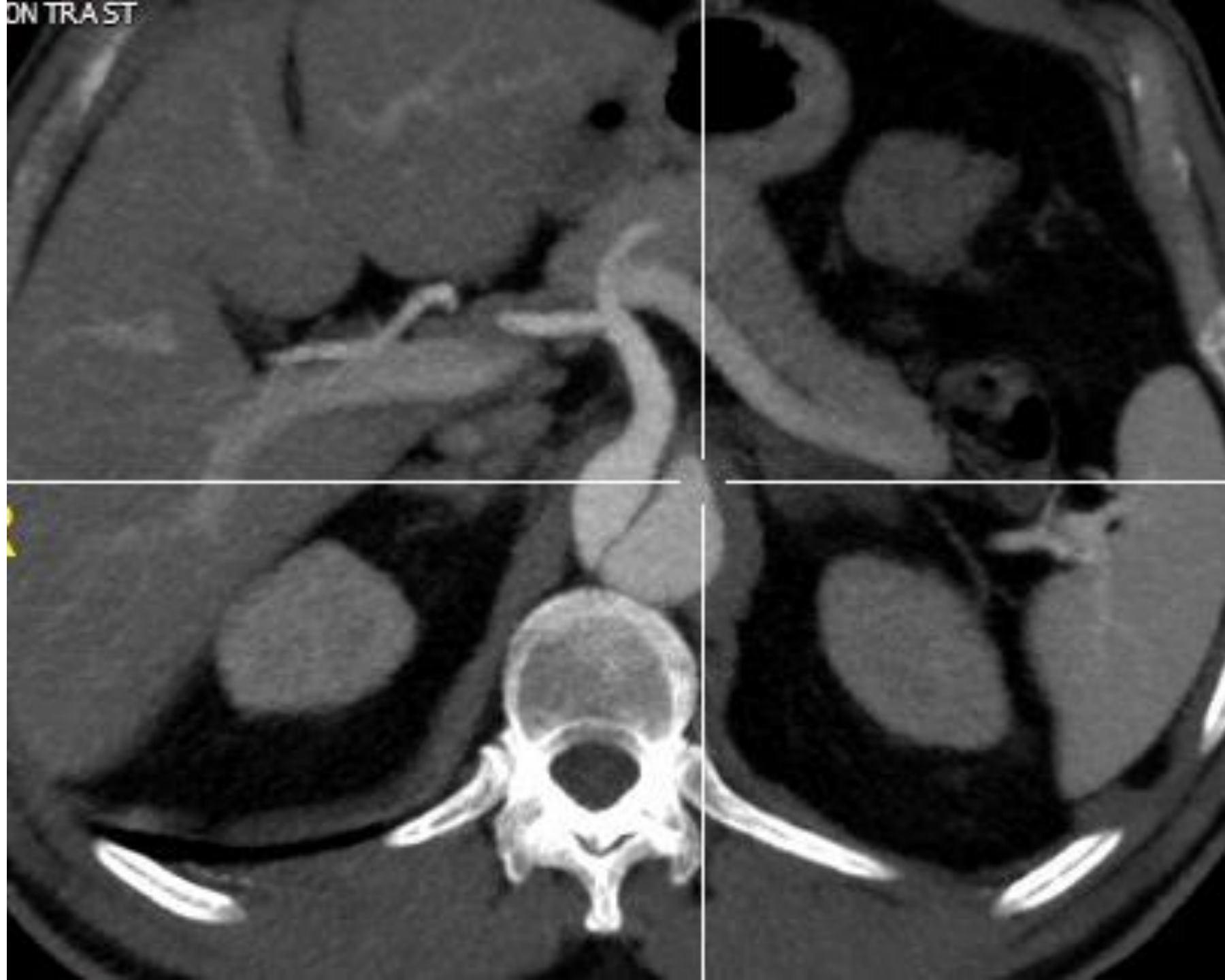
- Complex endovascular procedures for AAA with challenging anatomy can be performed safely and effectively in appropriately selected patients
- Immediate and mid-term outcomes are promising
- Emergent and urgent cases – chimney/snorkel technique

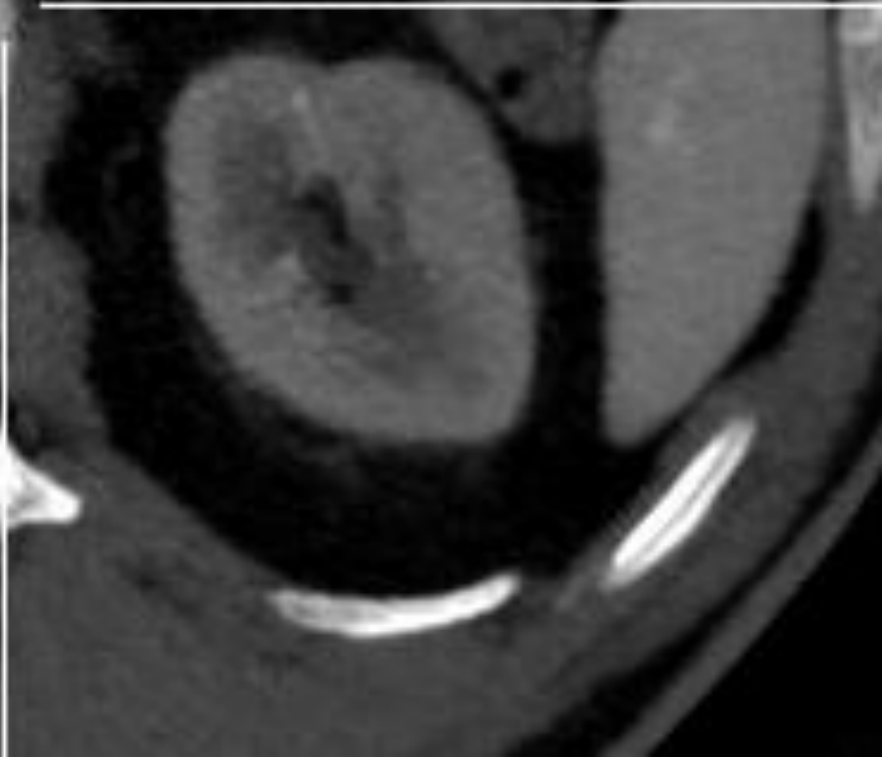
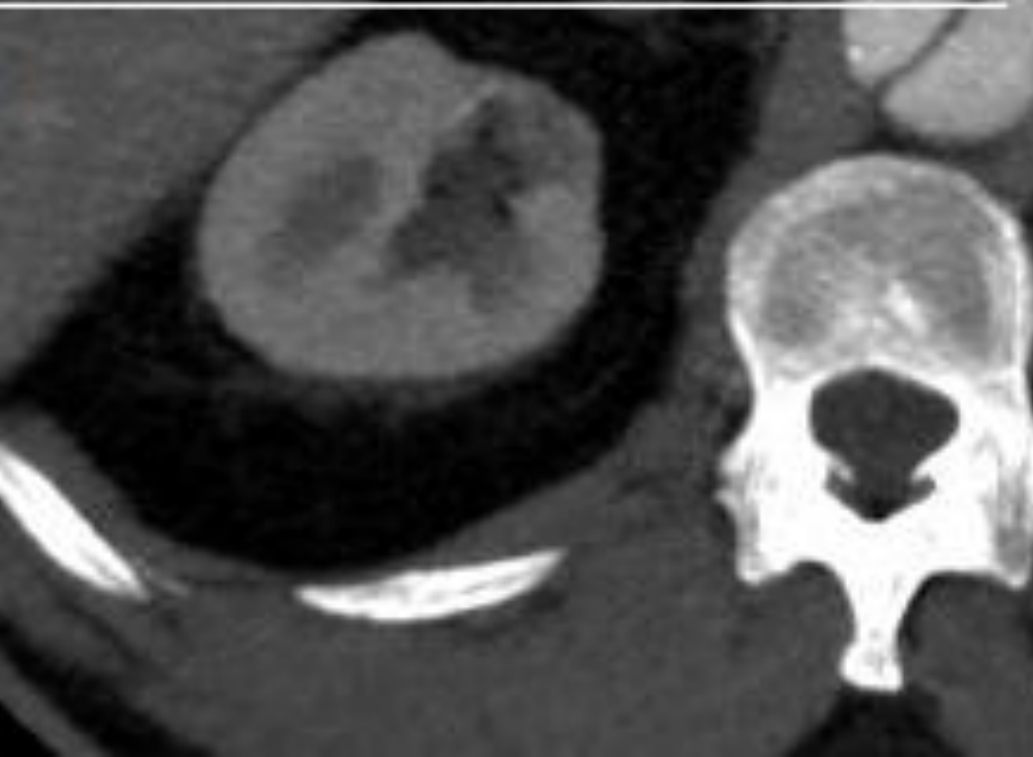
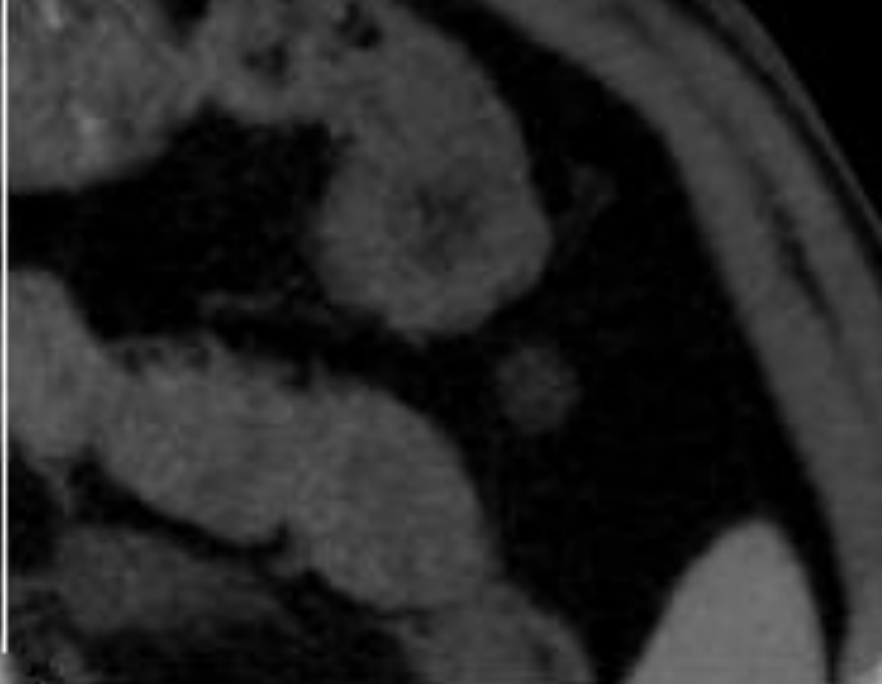


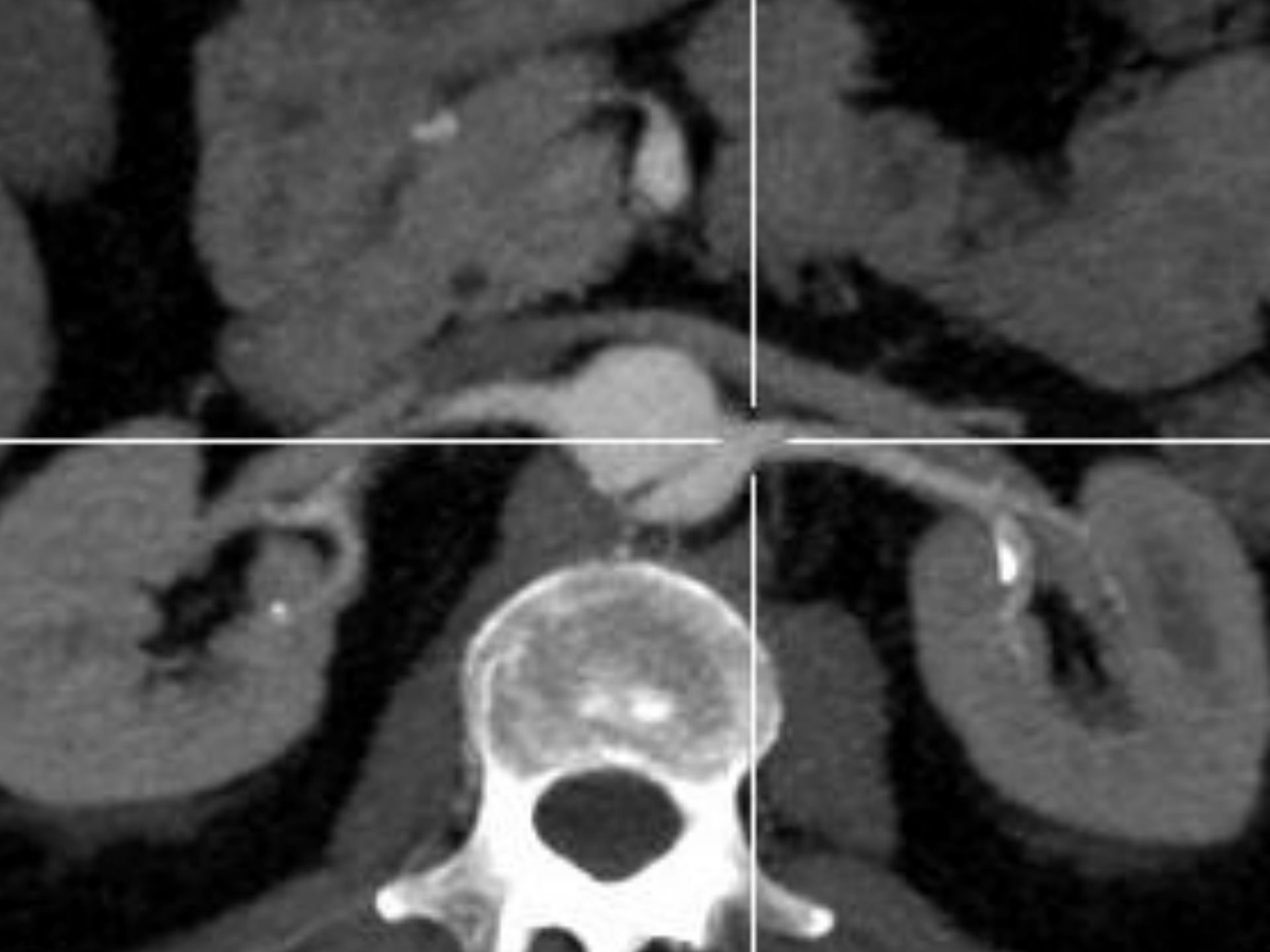




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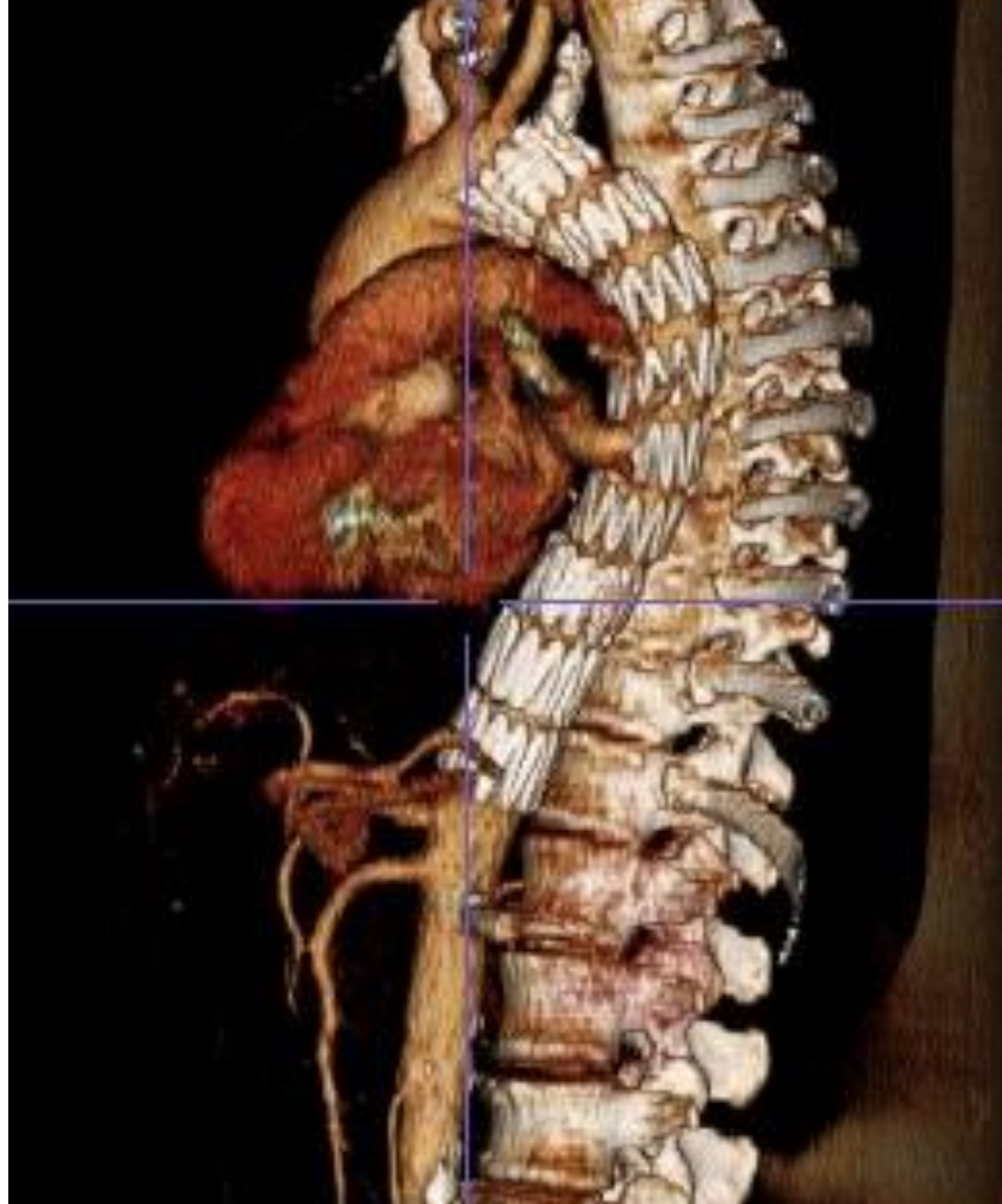




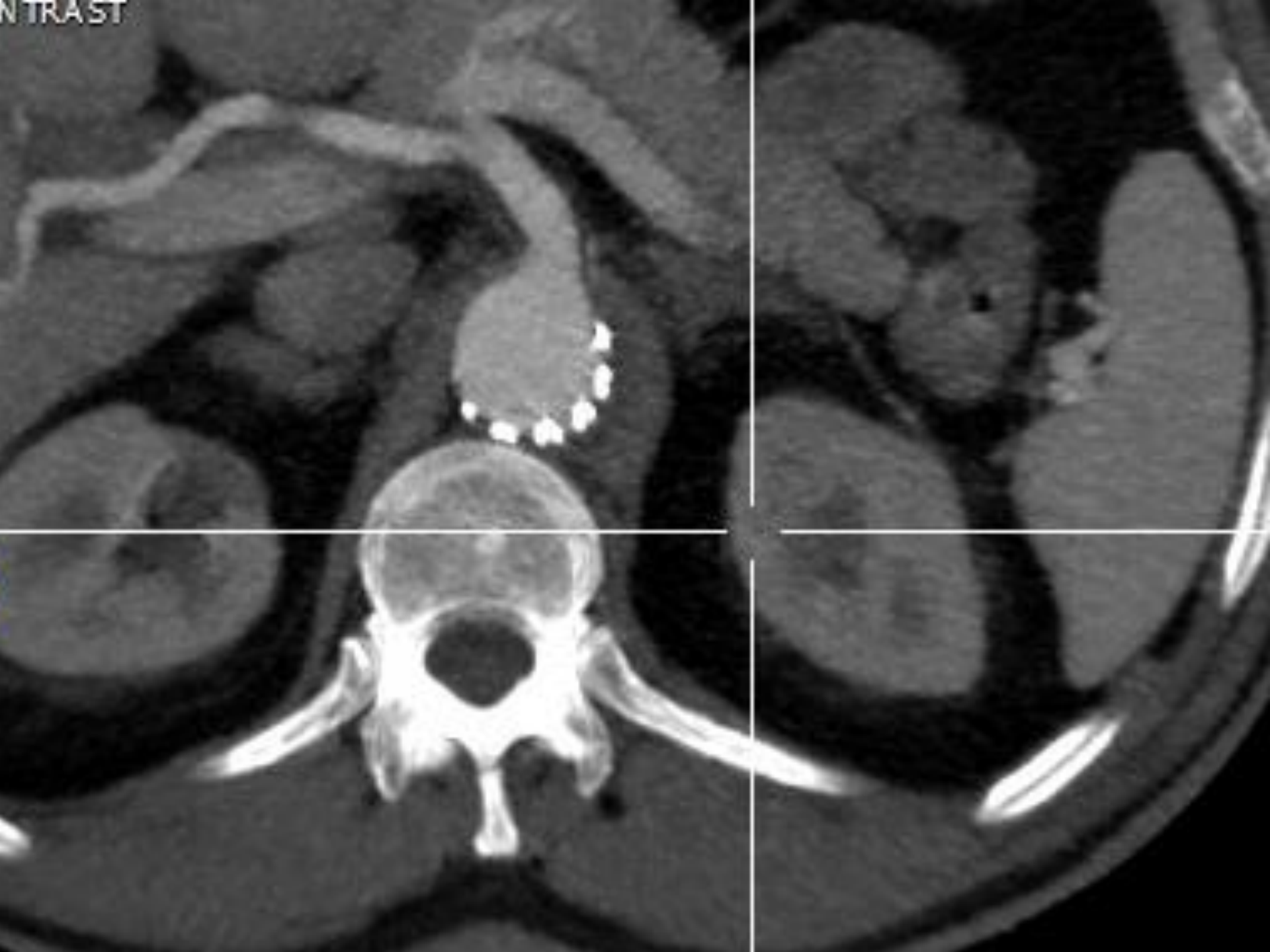


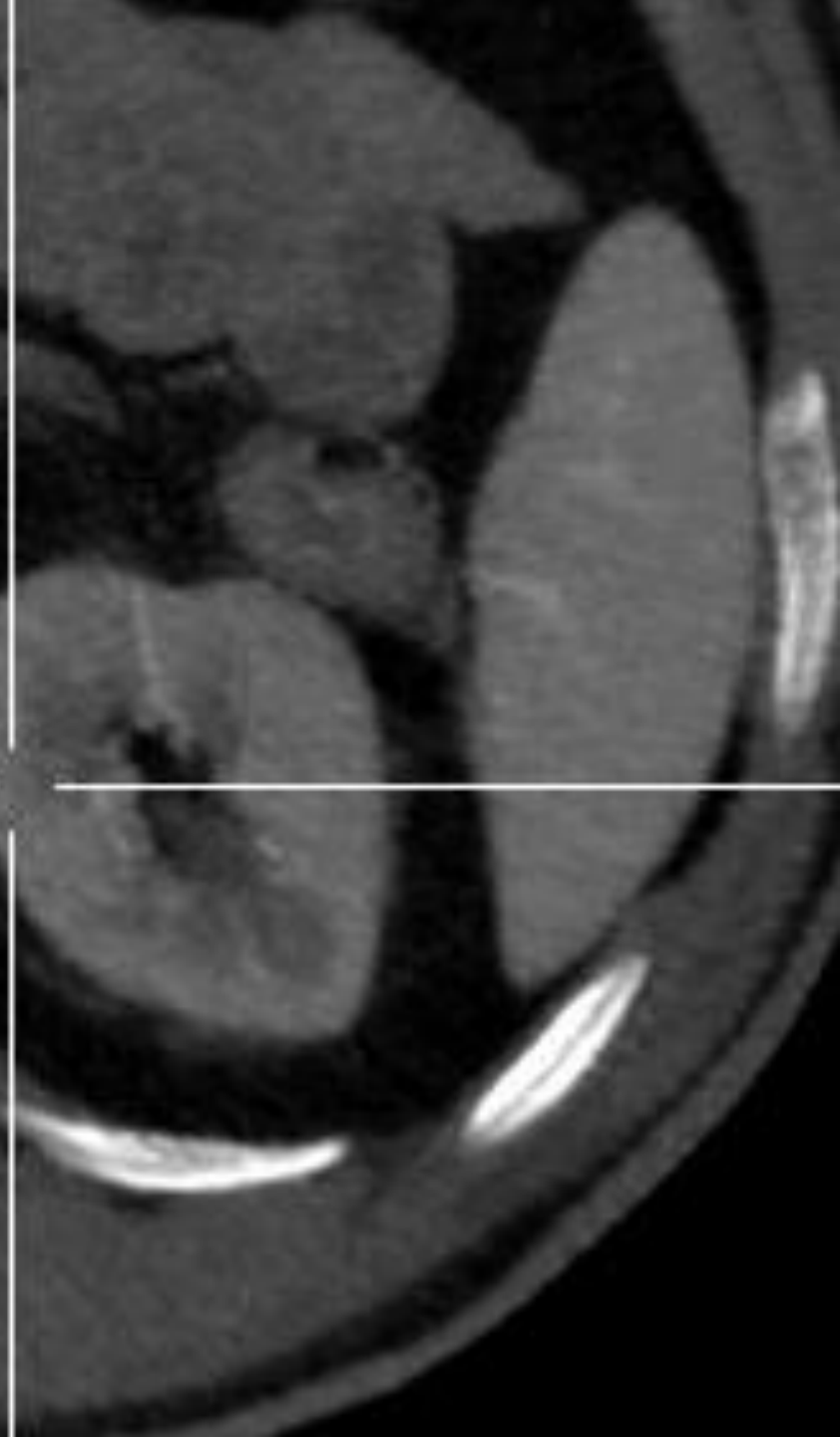
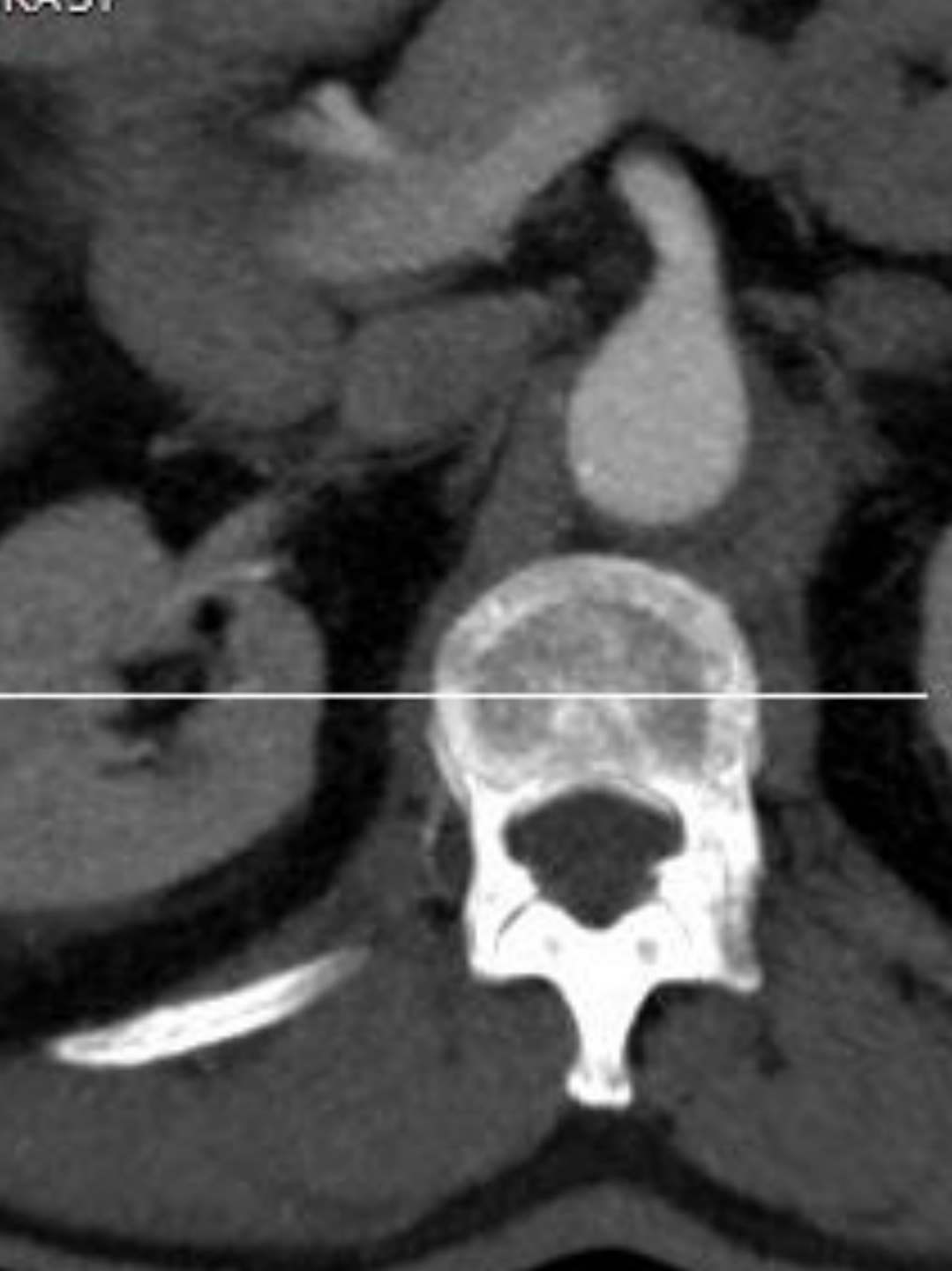
5 4,5 4 3,5 3 2,5 2 1,5 1 0,5 0 0,5 1 1,5 2 2,5 3 3,5 4 4,5 5  
cm





CONTRAST





CONTRAST

R



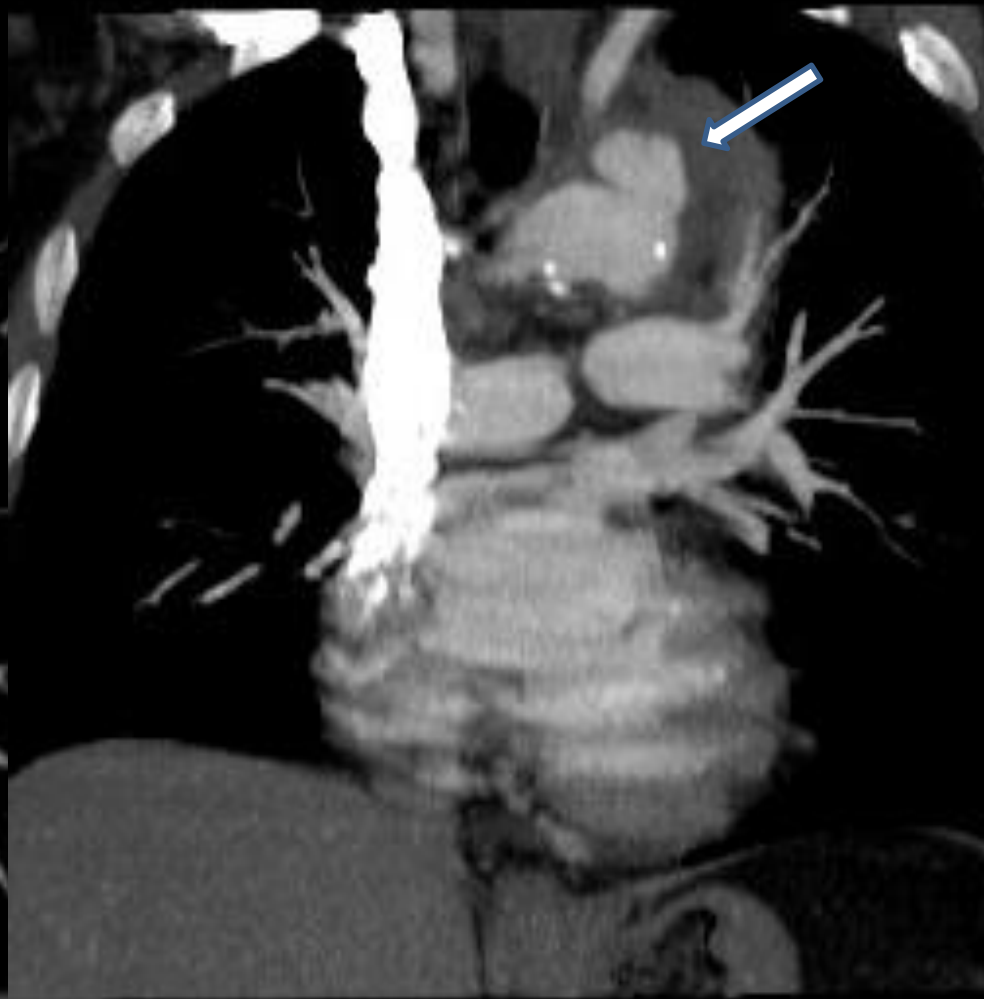
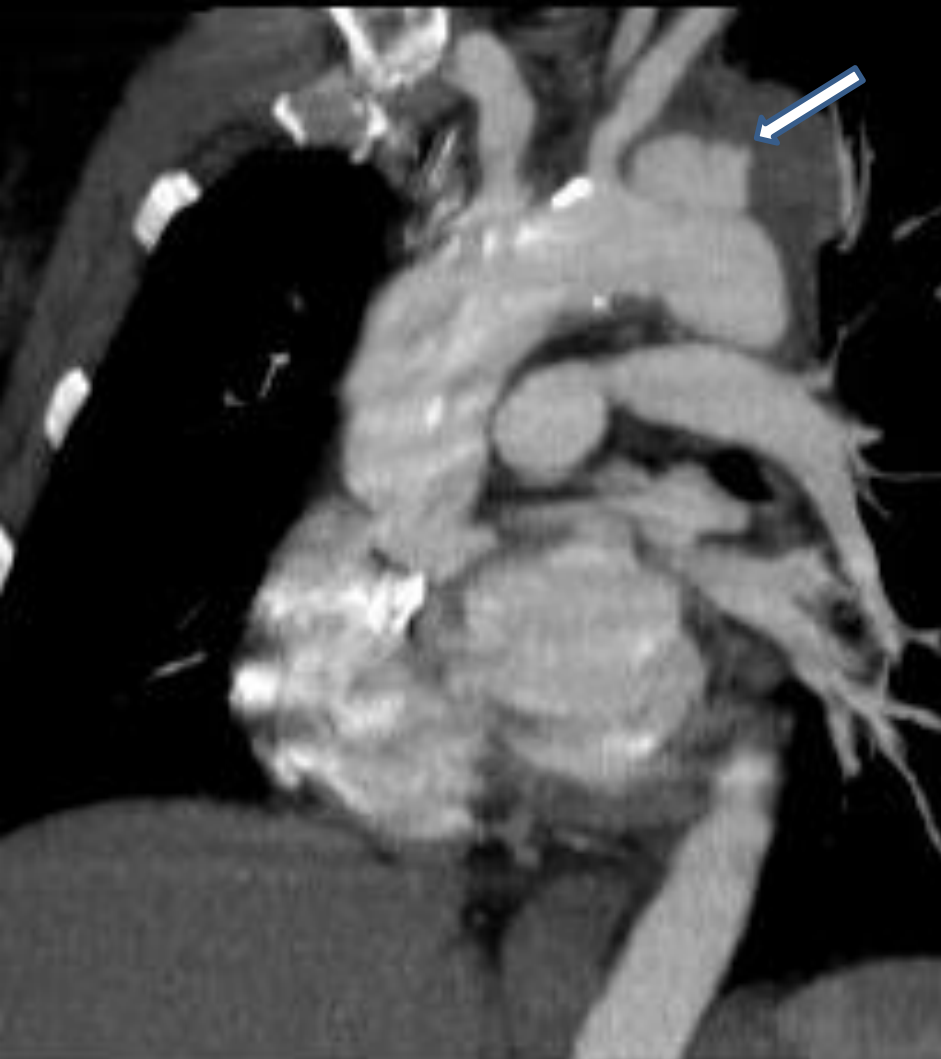
# TYP B DISEKCE AORTY

- Indikace k nefarmakologické léčbě
  - klinické
    - krvácení, ruptura
    - přetrvávající bolesti
    - viscerální, končetinová ischemie
    - neurologická symptomatologie
    - rezistentní hypertenze
  - morfologické
    - max. průměr aorty nad 40mm
    - max. průměr falešného lumen na 20-25mm

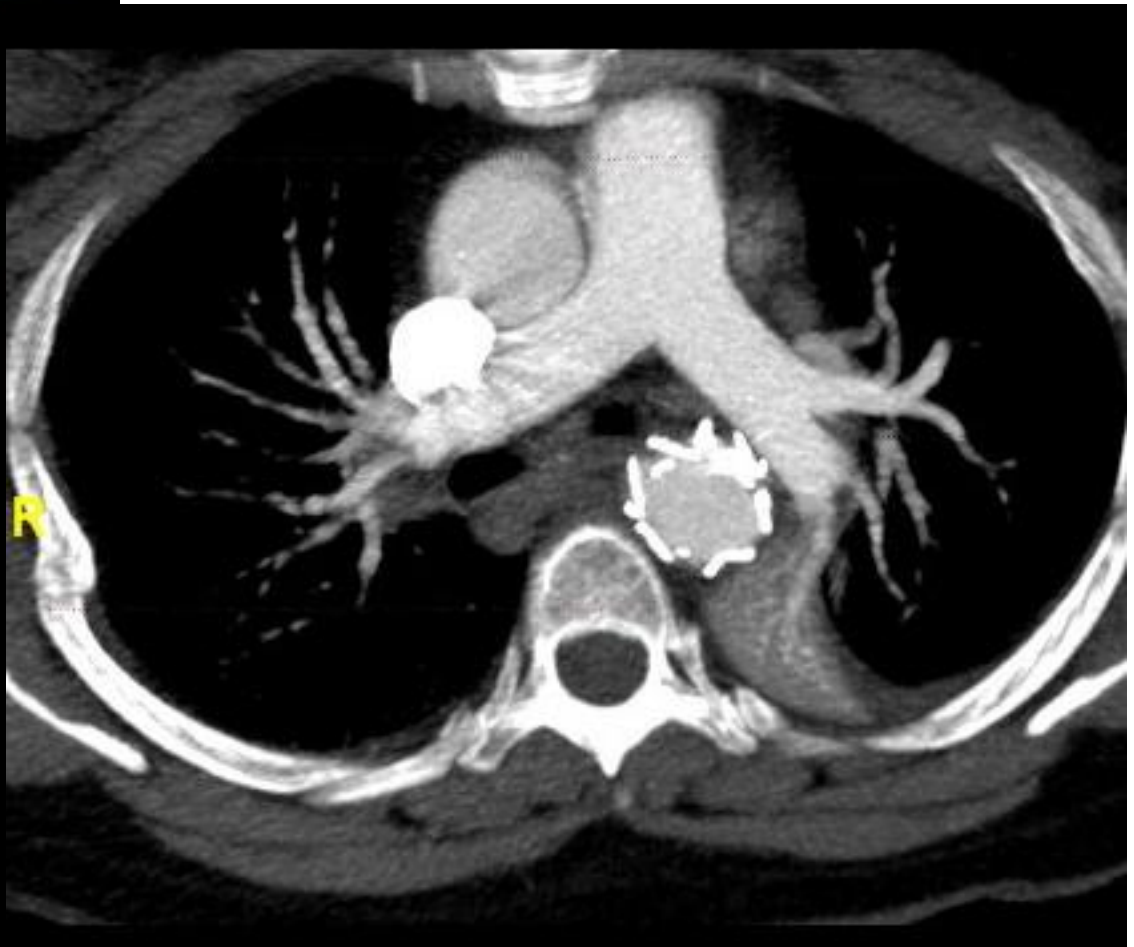
# Chronická disekce typ B

- Pozdní komplikace 20 – 50%
  - nová disekce (ruptura, krvácení)
  - růst (0,1 – 0,74 cm za rok, počáteční průměr)
    - sakulární, fusiformní aneuryzmatická degenerace
    - terapie BB snižuje riziko růstu a komplikací o 50%
- ThEVAR - 5,5 cm









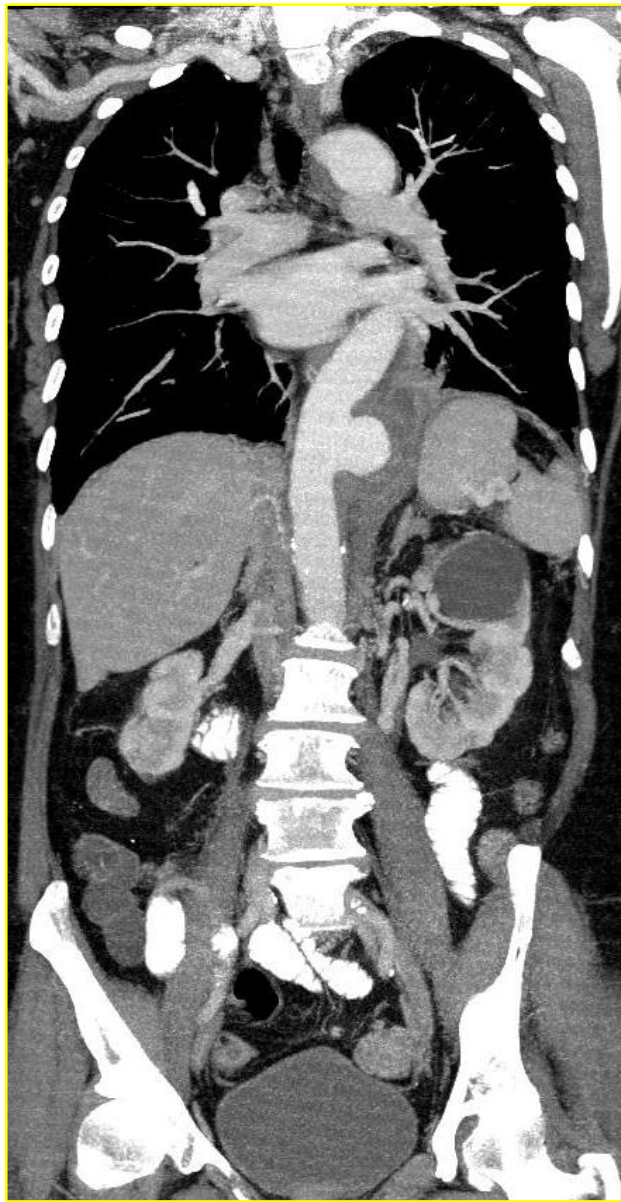
# Aneuryzma hrudní aorty

- Indikace k léčbě
  - symptomy
  - max. průměr 5,5 cm
  - nárůst 1 cm za rok

# Penetrující aortální vřed



15.4.2011

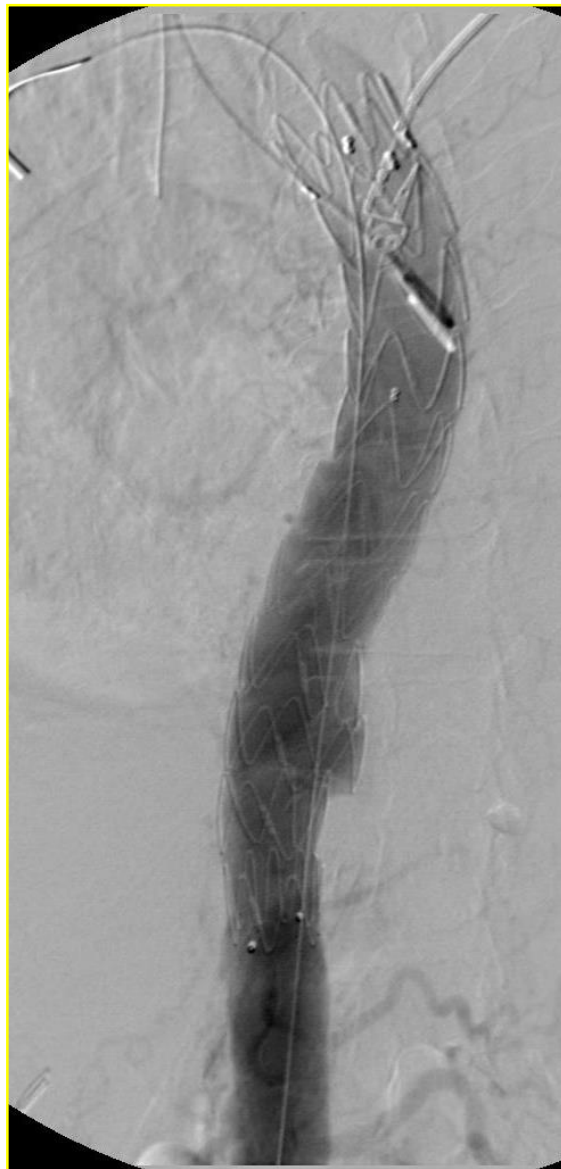


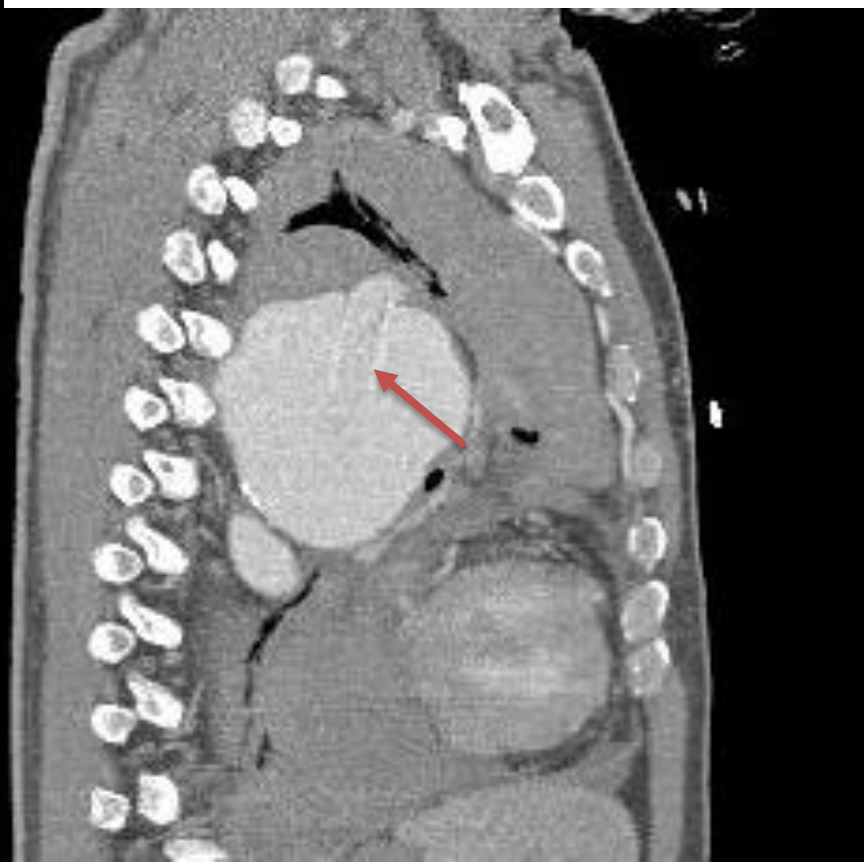
1.7.2011

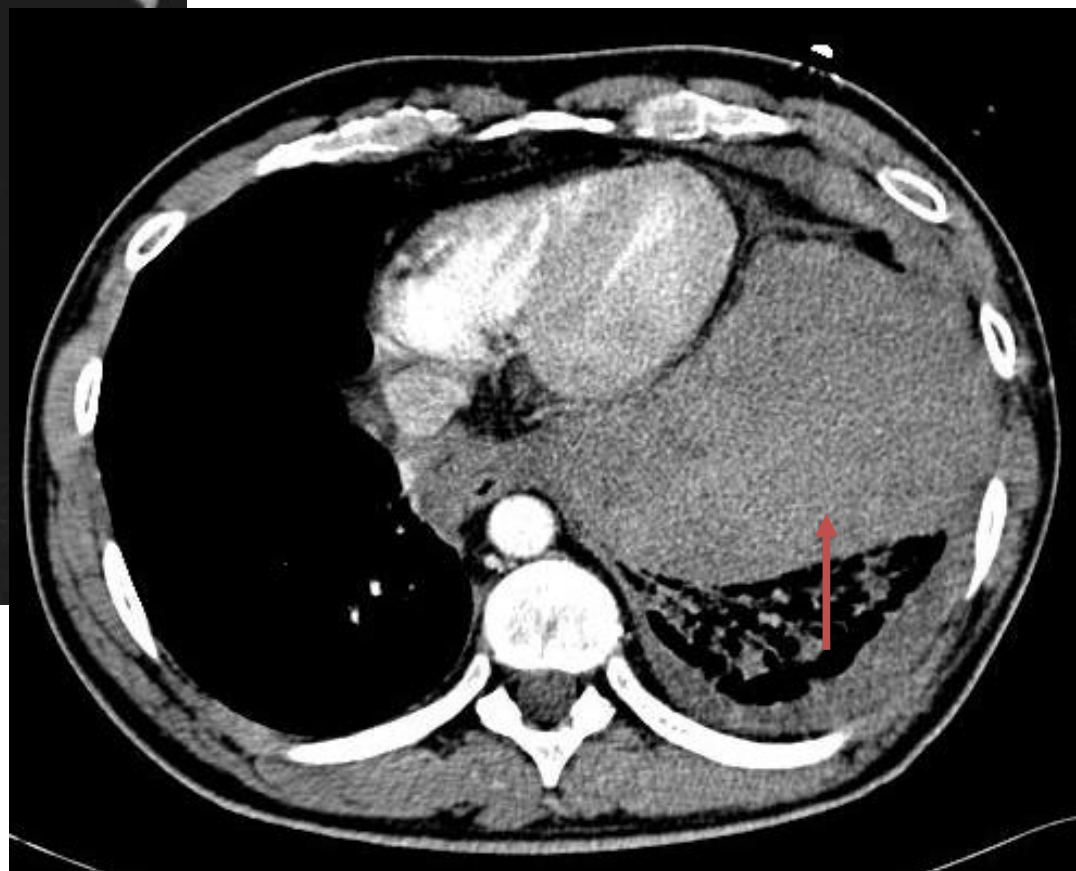
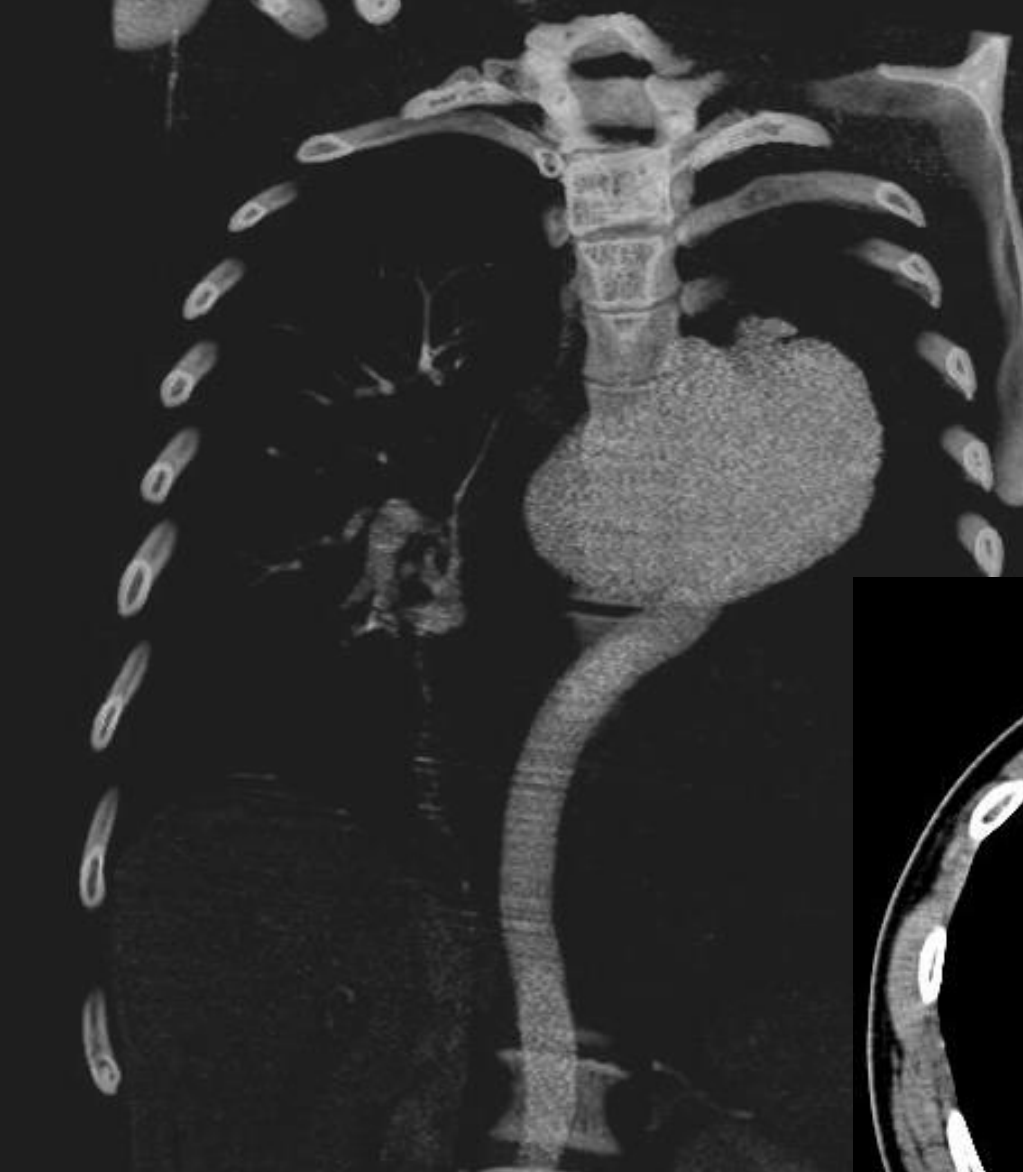


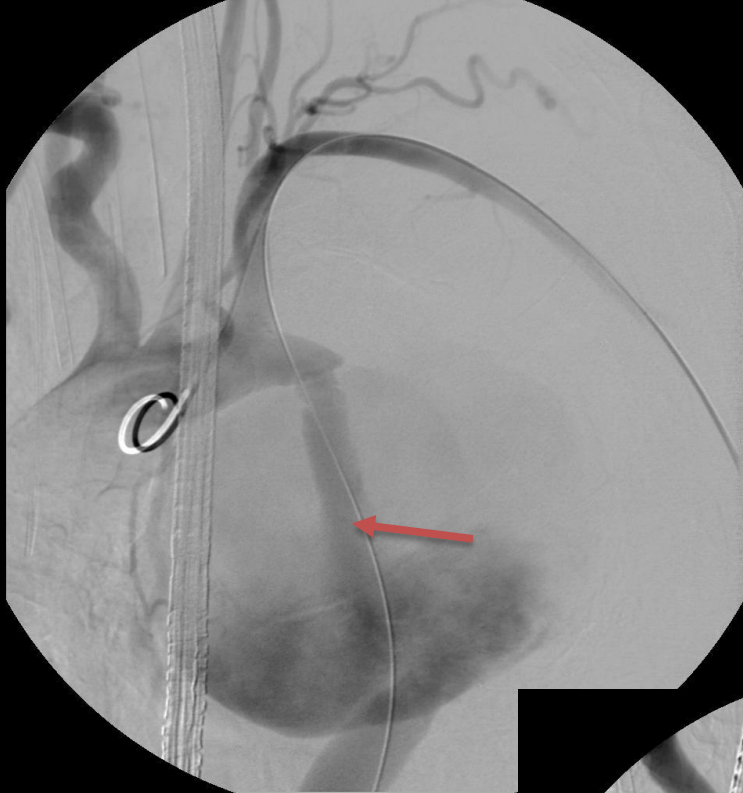
3.7.2011

# Penetrující aortální vřed





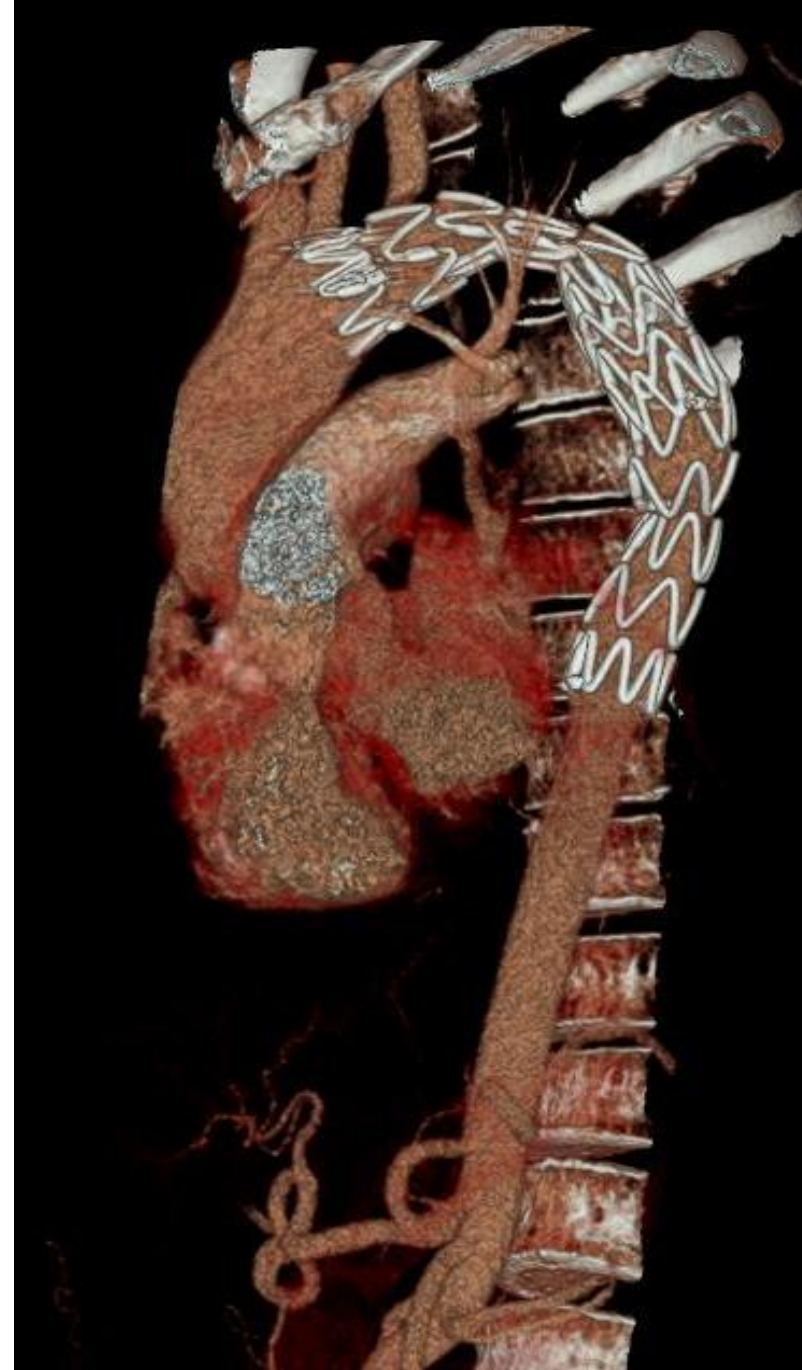


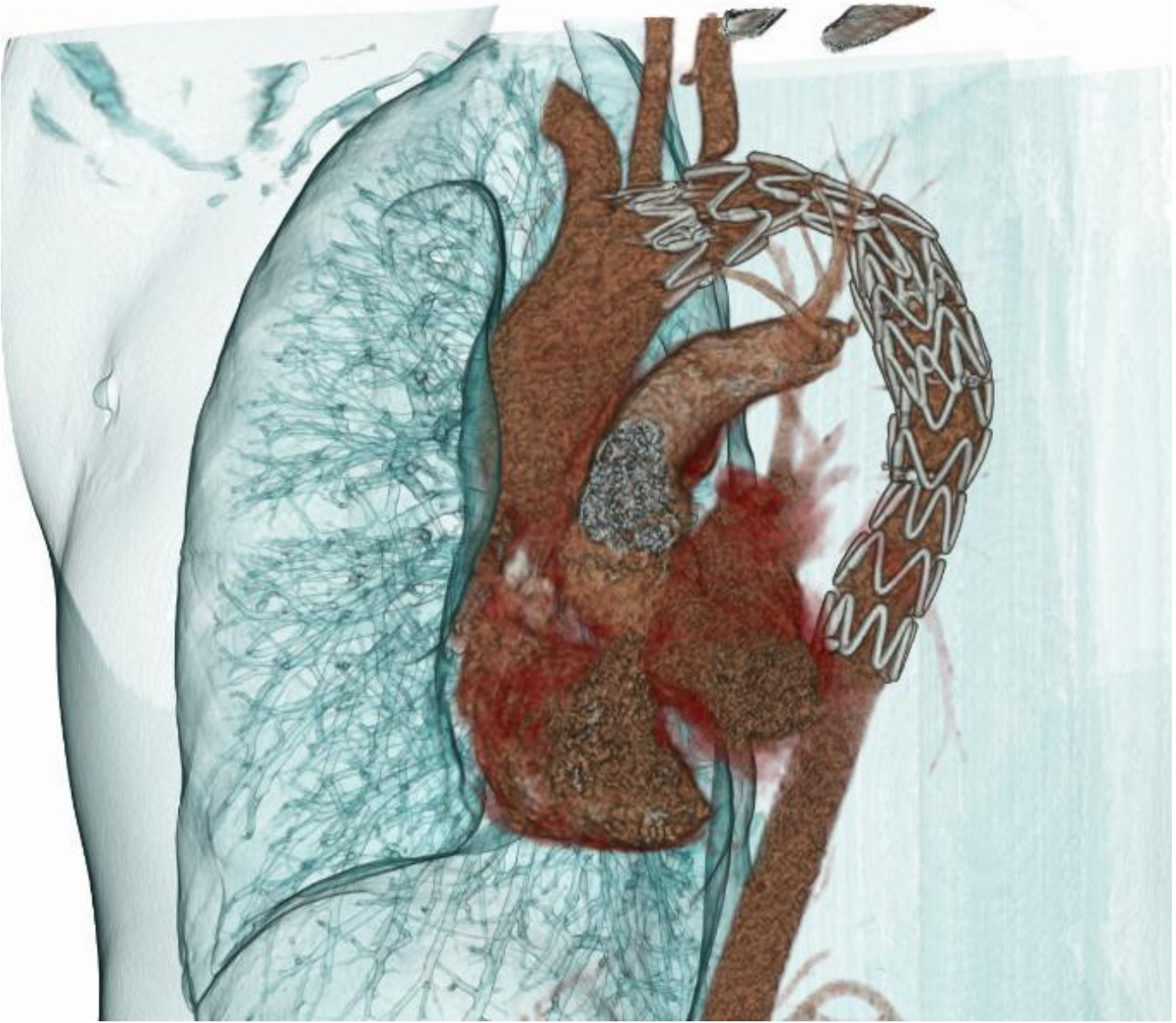


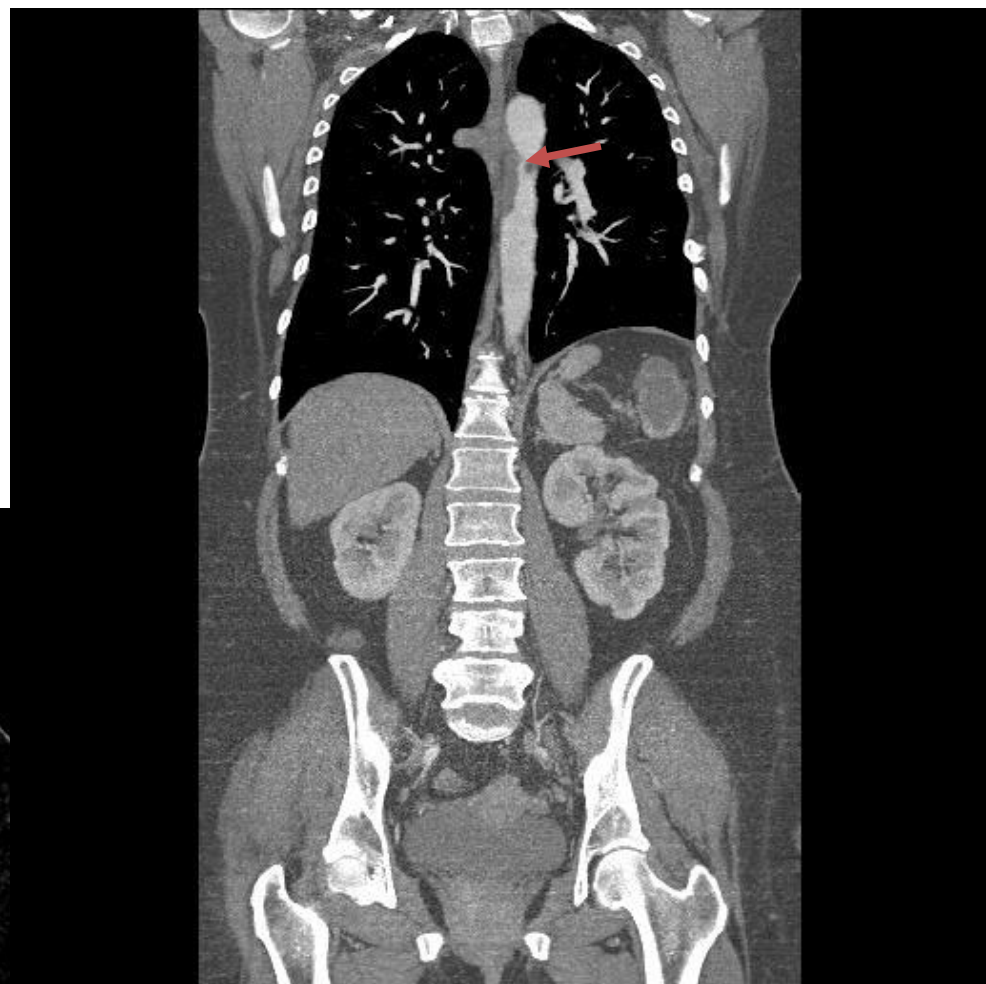
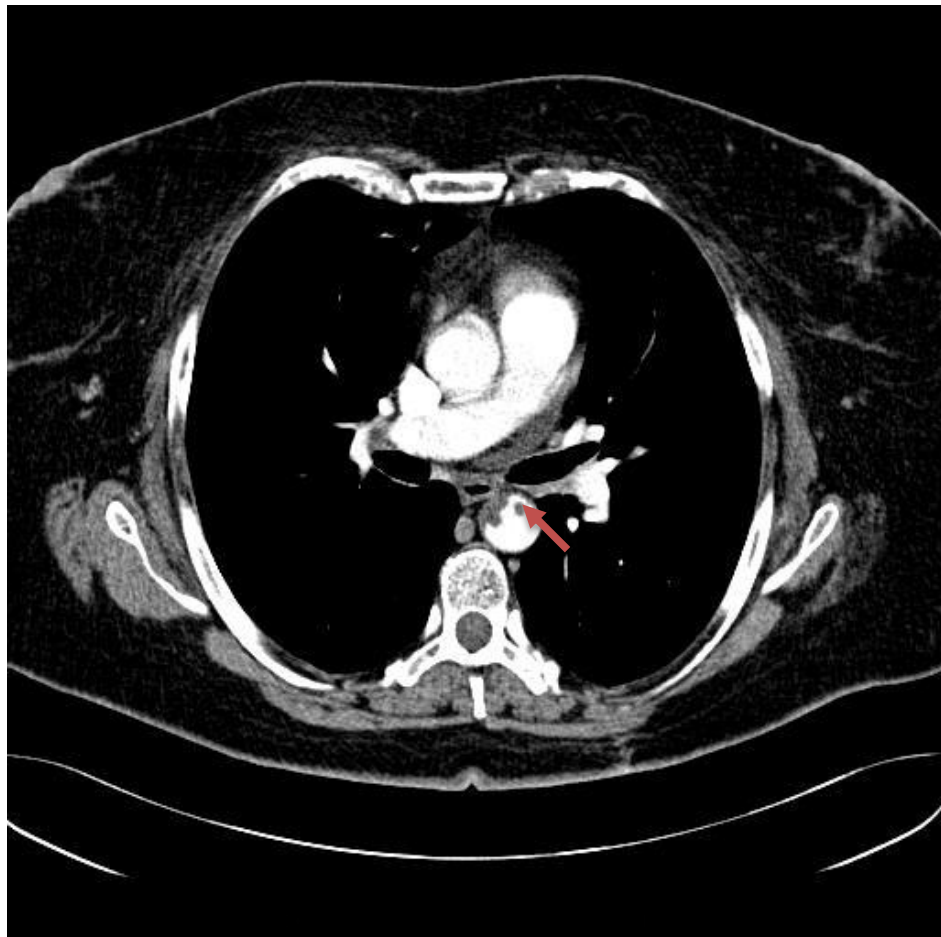


- 4. den kontrolní CT
- bronchoskopie bez čerstvého krvácení

- dimise 17. den





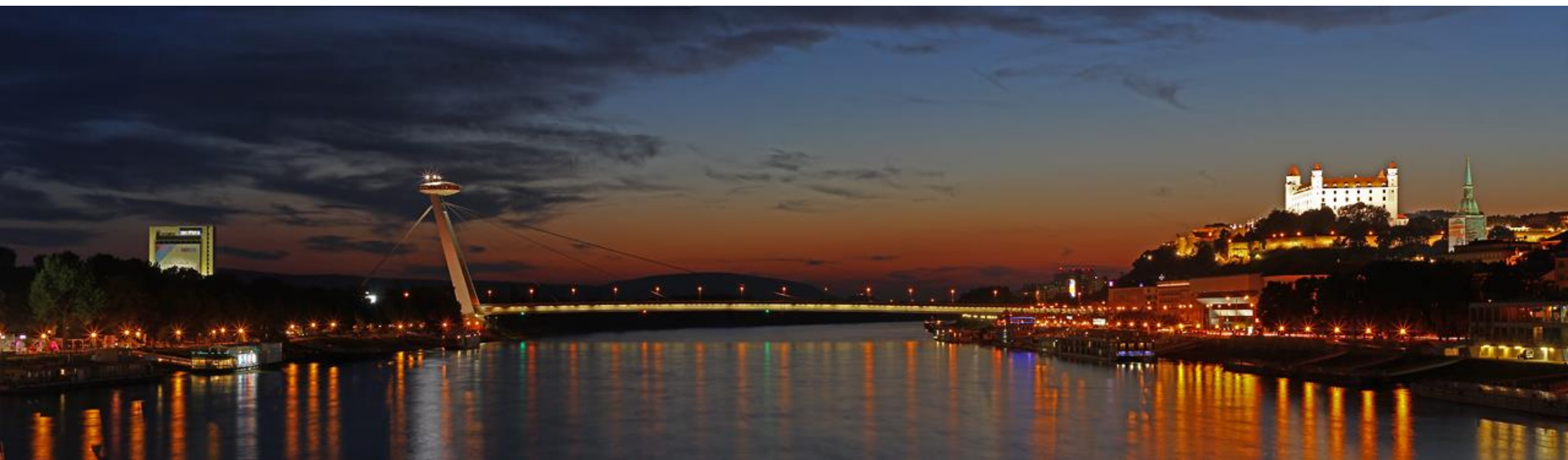






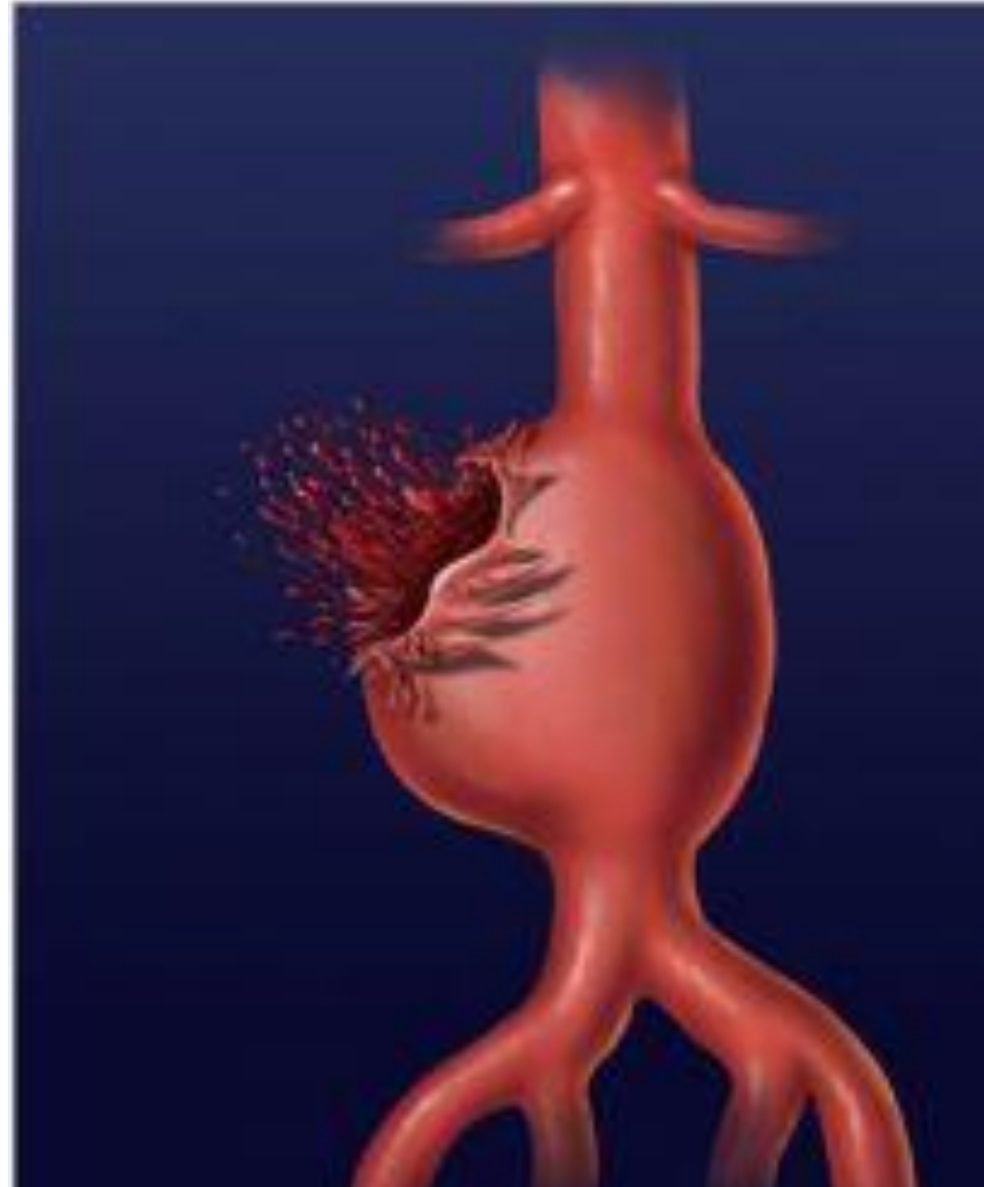
THANK YOU...





# Aneuryzma břišní aorty (AAA)

- Jediné CV onemocnění, na které je populační screening cílen
  - Morfologická definice
  - Neinvazivní testování
  - Mortalitní benefit





# RUPTURA AAA

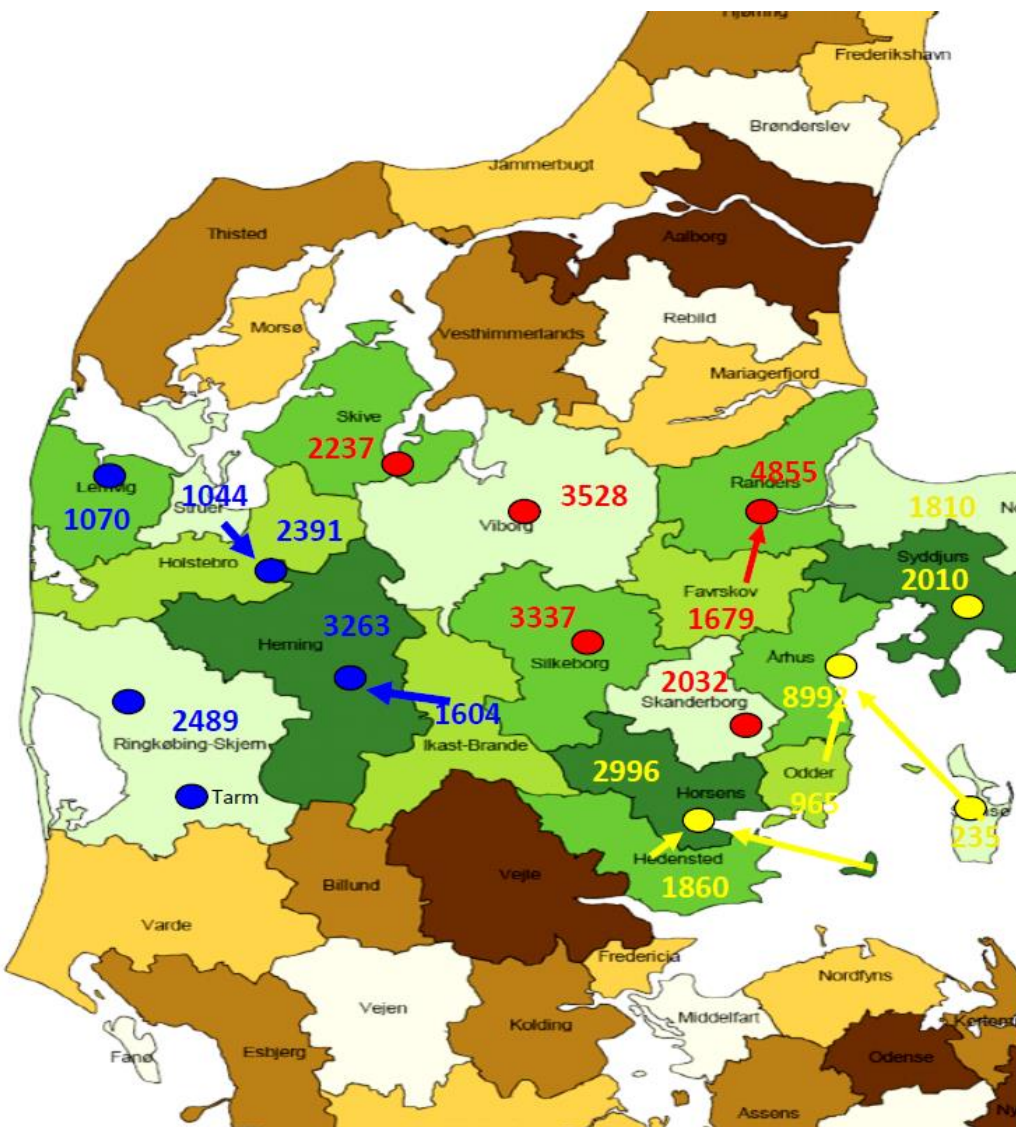
- Předhospitalizační mortalita
  - 59-83%
- Hospitalizační mortalita
  - Předoperační 30%
  - Otevřená operace (OR) 41%
  - EVAR 19%
- Šance na přežití rAAA 10-15%
- Elektivní výkon
  - OR 4-5%, EVAR 1%

| POPULACE                 | DOPORUČENÍ                                                               | ÚROVEŇ   |
|--------------------------|--------------------------------------------------------------------------|----------|
| Muži 65-75 let kuřáci    | USPSTF doporučuje screening AAA prostřednictvím UZ všeobecně             | <b>B</b> |
| Muži 65-75 let nekuřáci  | USPSTF doporučuje provádět screening AAA selektivně raději než všeobecně | <b>C</b> |
| Ženy 65-75 let kuřáčky   | USPSTF nepodává žádné doporučení                                         | <b>I</b> |
| Ženy 65-75 let nekuřáčky | USPSTF nedoporučuje provádět rutinní screening AAA                       | <b>D</b> |

- MAAS Trial (2002): 67800 mužů, délka sledování 13 let, (UK)
- Chichester Trial (2002): 6433 mužů, 9342 žen, délka sledování 15 let, (UK)
- VIBORG Trial (2005): 12639 mužů, délka sledování 13 let, (Dánsko)
- Western Australian Trial (2004): 41000 mužů, délka sledování 3,6 let, (Austrálie)

# VIVA Trial (The **VI**borg **VA**scular)





## Enrollment 2008-2011

- Central Region of Denmark – 1.2 million inhabitant (>1/5 of the Danish population)
- No exclusions: **All 50,168 men randomised**
- Computerbased randomisation secured consent - stratified by the 16 municipalities
- The control group was masked
- Authors had no influence on- and were blinded for outcomes to date of analysis

● : Team East; 17,668  
 ● : Team Mid; 17,636  
 ● : Team West; 14,864

## Organisation

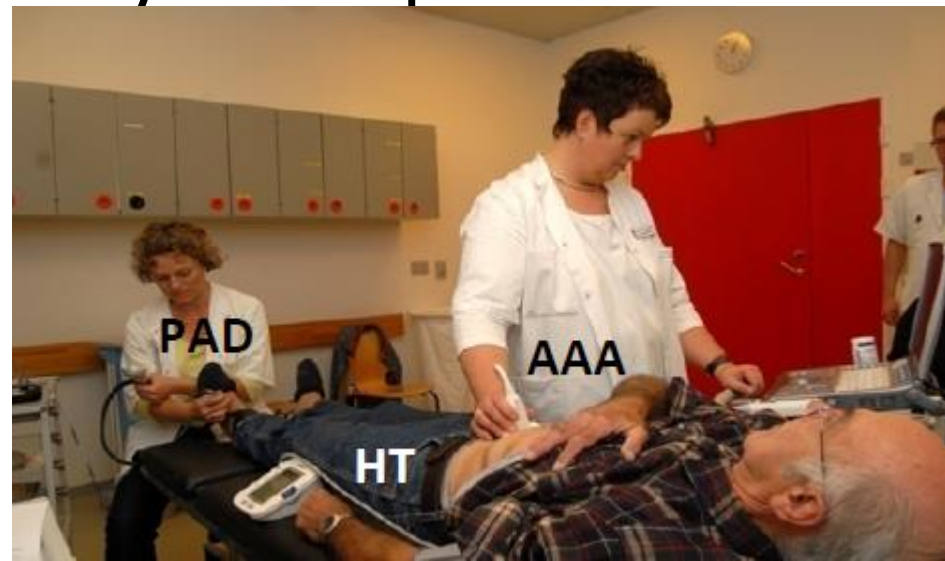
- at 14 local hospitals/Health centres
- by 6 special-trained nurses
- in 3 mobile teams
- Abdominal US and Doppler-based ABI (Pic) + consultations of positive findings + controls
- Assisted by a secretary



The VIVA screening trial team 2008

# Primární cíl

- Aktivní „*vascular triple screening*“
  - AAA (*max.  $\varnothing$  aorty  $\geq 30\text{mm}$* )
  - PAD (*ABI  $<0,9$   $>1,4$* )
  - AH (*TK  $>160/100$  mmHg*)
- Ovlivnění celkové mortality ve skupině mužů 65-74 let



# Sekundární cíl

- Mortalita
  - CV
  - AR (aneuryzma)
- Hospitalizace z důvodů CV onemocnění
- QoL (vliv pozitivního testování na AAA, PAD)
- Ekonomické náklady
- Vedlejší nálezy
  - Progrese aneuryzmatu
  - DM, ICH, RF, Ca
  - 30d mortalita po CV procedurách

# Aktivní intervence

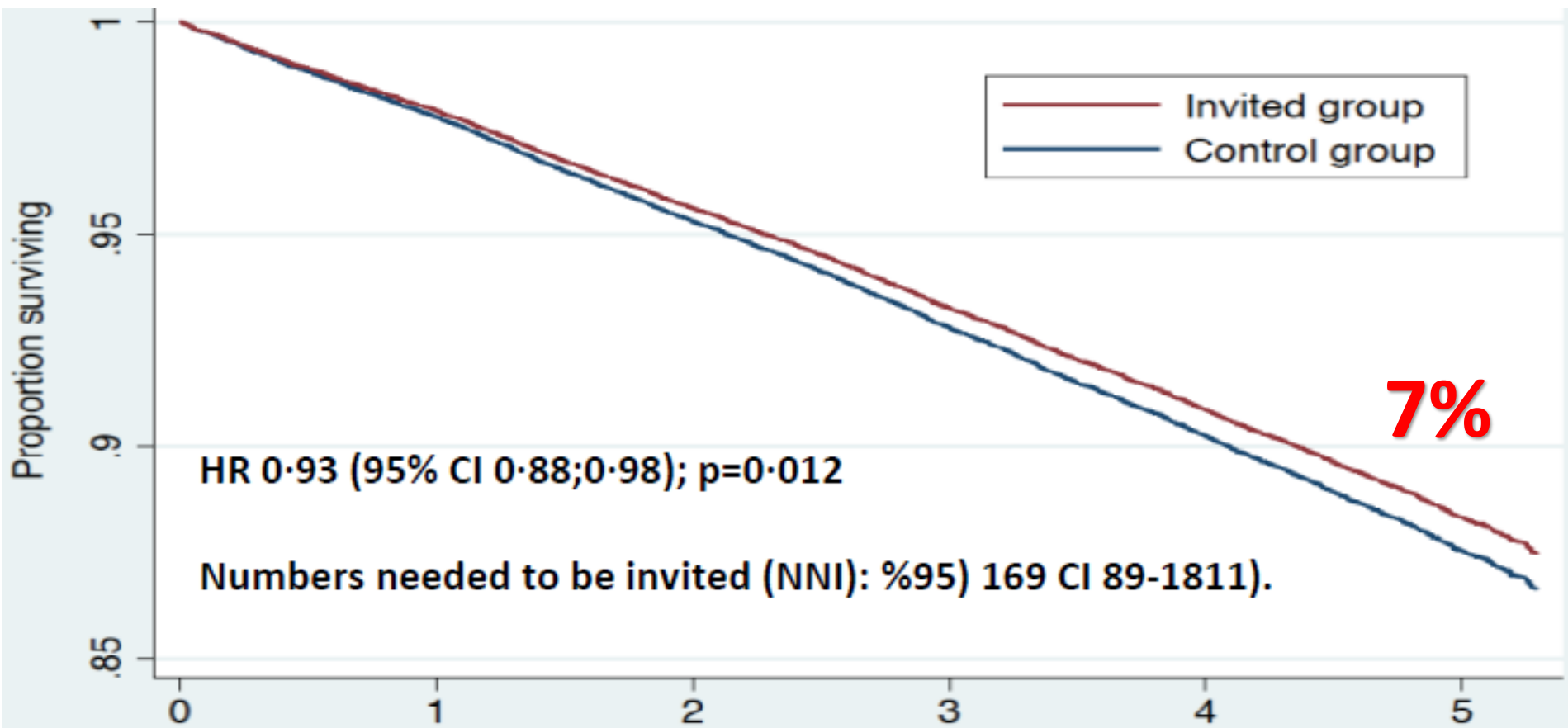
- AAA
  - < 50mm – UZ kontroly á 12 měsíců
  - > 50mm – CTAG, předání do specializovaného centra
- PAD
  - 75mg ASA, 40mg Simvastatin (c-chol > 4 mmol/l), dietní opatření, zanechání kouření, trénink
- AH
  - Předán k léčbě GP

- Účast ve studii: 75%
- AAA
  - 619 AAAs (3,3%)
  - 61 (0,3%) > 55mm
  - 307 (49,6%) bylo v průběhu 5 let řešeno
- PAD
  - 2073 (11%)
  - 1129 (60%) kladikace
  - 80 (4%) bylo v průběhu 5 let řešeno
- AH
  - 1963 (10%) s pravděpodobnou AH
  - 1/3 byla zahájena léčba

# Charakteristika souboru

|                                            | Control group | Invited group |
|--------------------------------------------|---------------|---------------|
| Age (years)                                | 69 (64-75)    | 69 (64-75)    |
| Prescription medication during last year   |               |               |
| Antithrombotic agents                      | 7426 (30%)    | 7479 (30%)    |
| Lipid modifying agents                     | 8863 (35%)    | 8904 (36%)    |
| Antihypertensives and beta blocking agents | 5635 (22%)    | 5475 (22%)    |
| Drugs used in diabetes                     | 2534 (10%)    | 2445 (10%)    |
| Hospital admission during last 5 years     |               |               |
| Arterial hypertension                      | 760 (3%)      | 744 (3%)      |
| AMI                                        | 650 (3%)      | 685 (3%)      |
| Ischemic heart disease ex. AMI             | 1638 (7%)     | 1643 (7%)     |
| Peripheral occlusive arterial disease      | 269 (1%)      | 247 (1%)      |
| Stroke or transient ischemic attack        | 753 (3%)      | 734 (3%)      |
| Chronic obstructive pulmonary disease      | 692 (3%)      | 718 (3%)      |

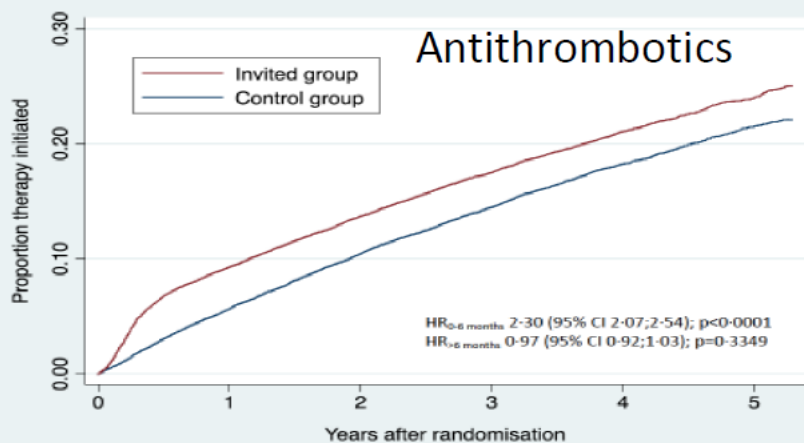
# Celková mortalita



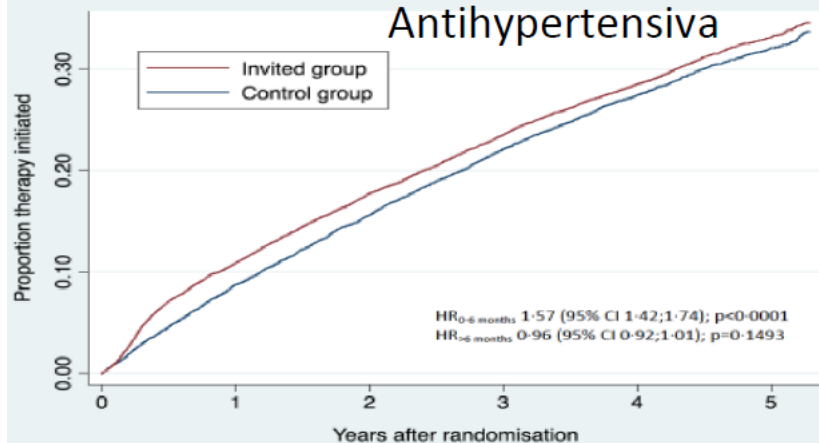
# VIVA výsledky

- Celková mortalita  **7%**
  - mortalita spojená s AAA – NS
  - CV mortalita – NS
  - Ca mortalita – NS
- Větší profit byl zaznamenán ve skupině kuřáků a těch, u kterých byla zahájena AH terapie
- Výrazně vyšší počet elektivních výkonů pro AAA

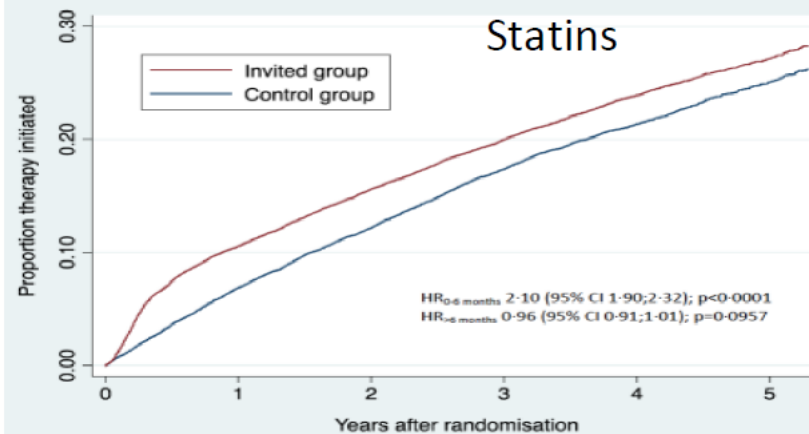
## Antithrombotics



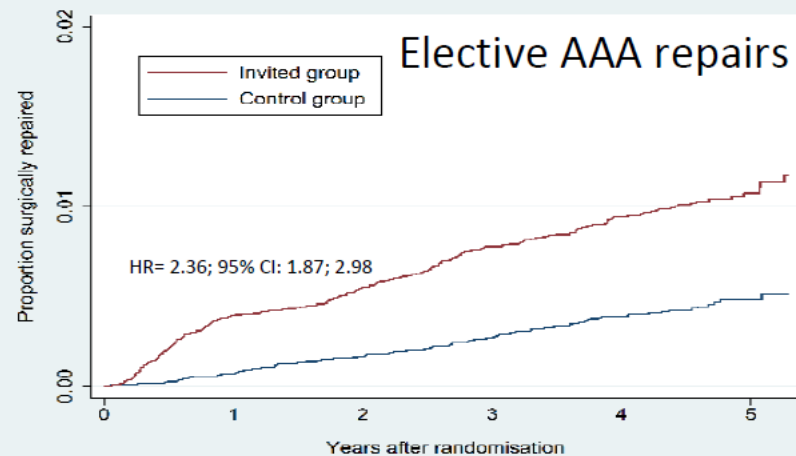
## Antihypertensives



## Statins



## Elective AAA repairs



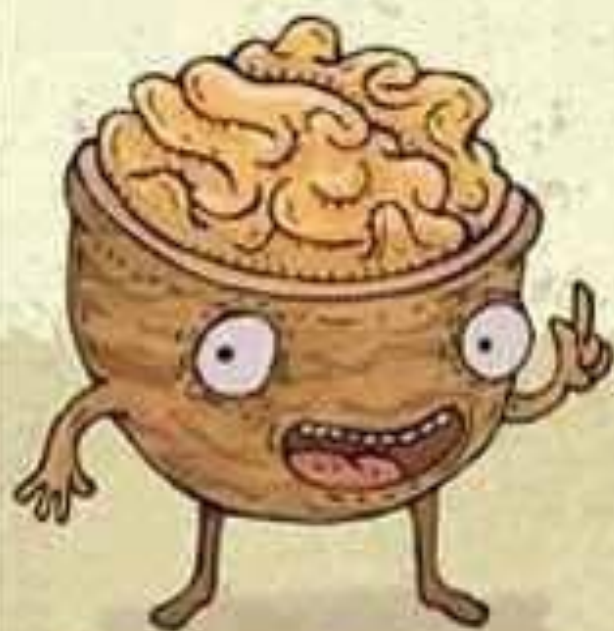
# Vascular triple screening u mužů 65-74 let

- 7% snížení celkové mortality
  - 169 NNI
  - € 2148 QUALY
- 
- AAA & PAD by měly být léčeni ASA & statiny
  - Zavedení postupu „*vascular triple screening*“  
*do klinické praxe?*

I am a Broccoli  
and I look like  
a tree!



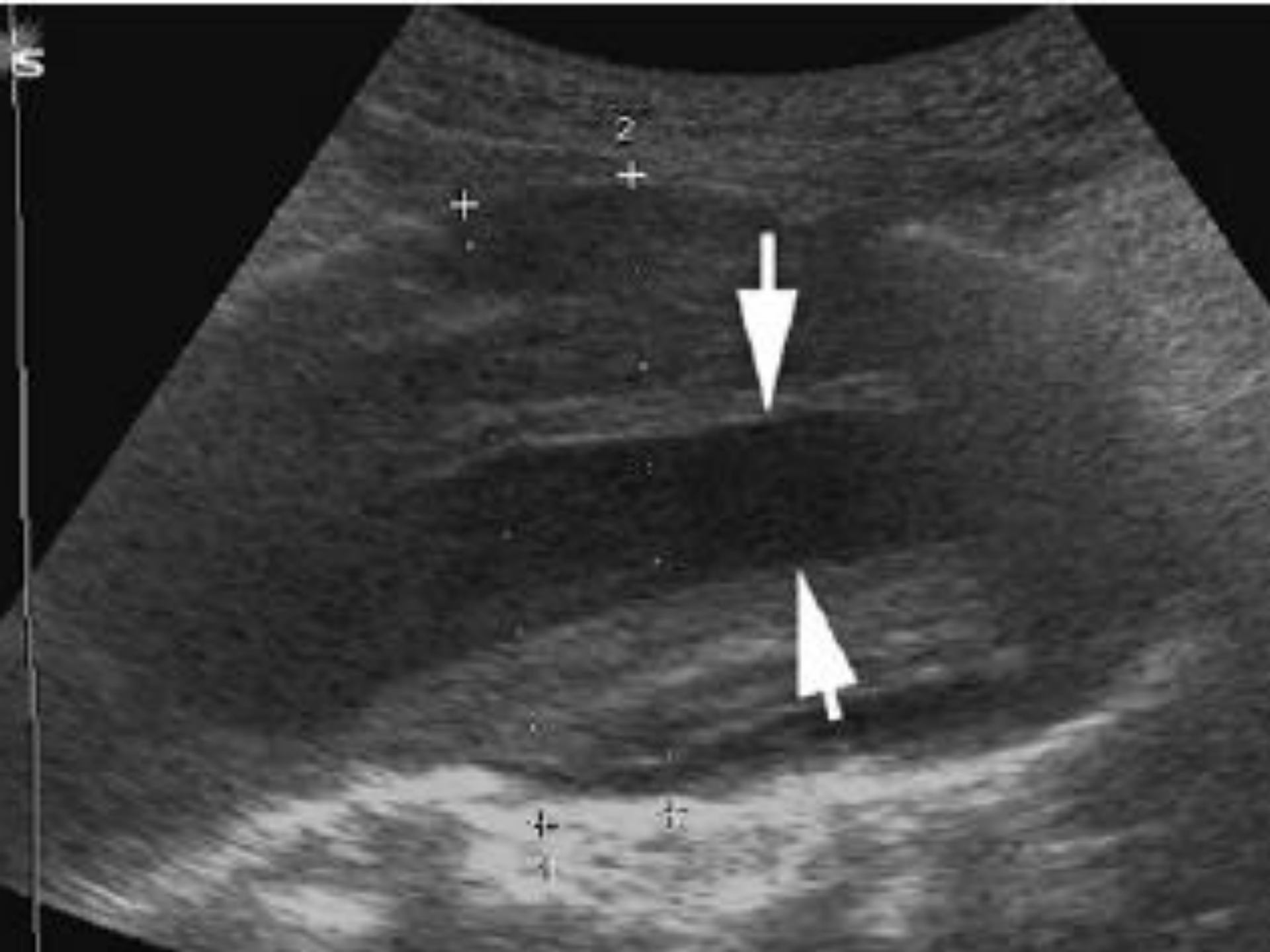
I am a walnut  
and I look like  
a brain!



I am a  
mushroom  
and I **HATE**  
this game!!



Matt



## Disclosure

Speaker name: Petr Varejka MD

.....

I have the following potential conflicts of interest to report:

- ☐ Consulting
- ☐ Employment in industry
- ☐ Stockholder of a healthcare company
- ☐ Owner of a healthcare company
- ☐ Other(s)
  
- ☒ I do not have any potential conflict of interest