Endovascular techniques and adjuncts in Ruptured abdominal aortic aneurysms

Athar J Arain

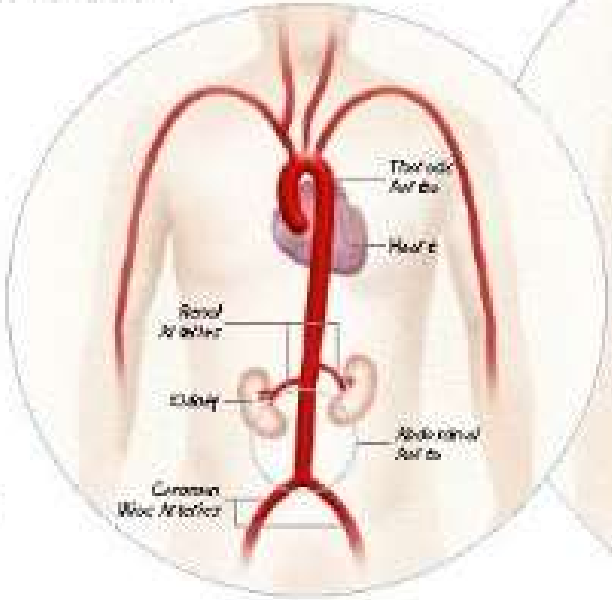
University of Witwatersrand

Albert Einstein died from an abdominal aortic aneurysm, a type of vascular disease that affects more than 700,000 people in Europe.

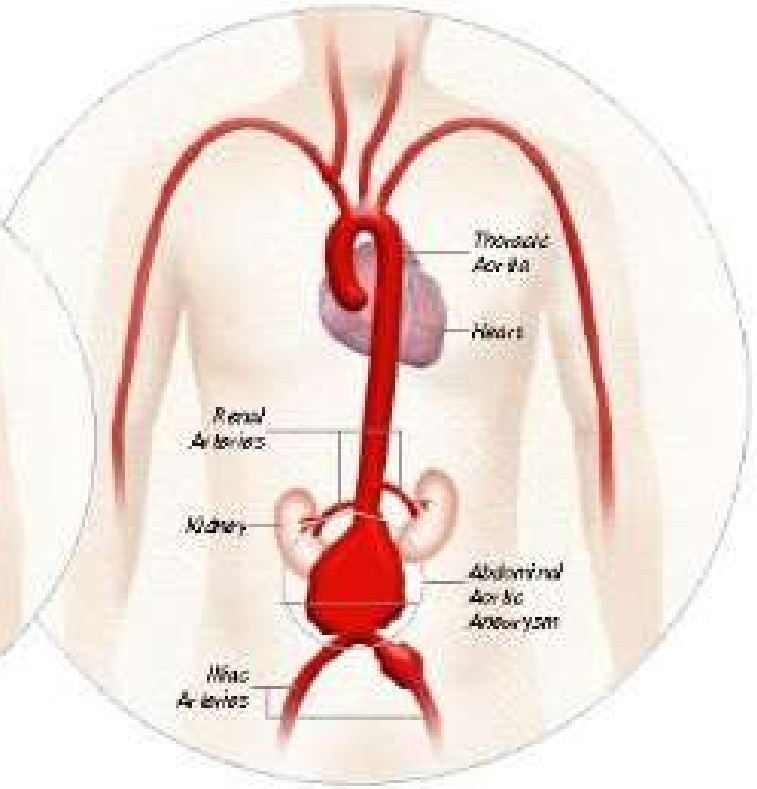
Abdominal Aortic Aneurysm

What is an Abdominal Aortic Aneurysm (or AAA)?

- An Abdominal Aortic Aneurysm (AAA) is a permanentlocalized dilatation of the abdominal aorta.
- The disorder is conventionally diagnosed if the aortic diameter is 30 mm or more.
- Or increase in size of Vessel 1 and half times normal diameter



Normal aorta



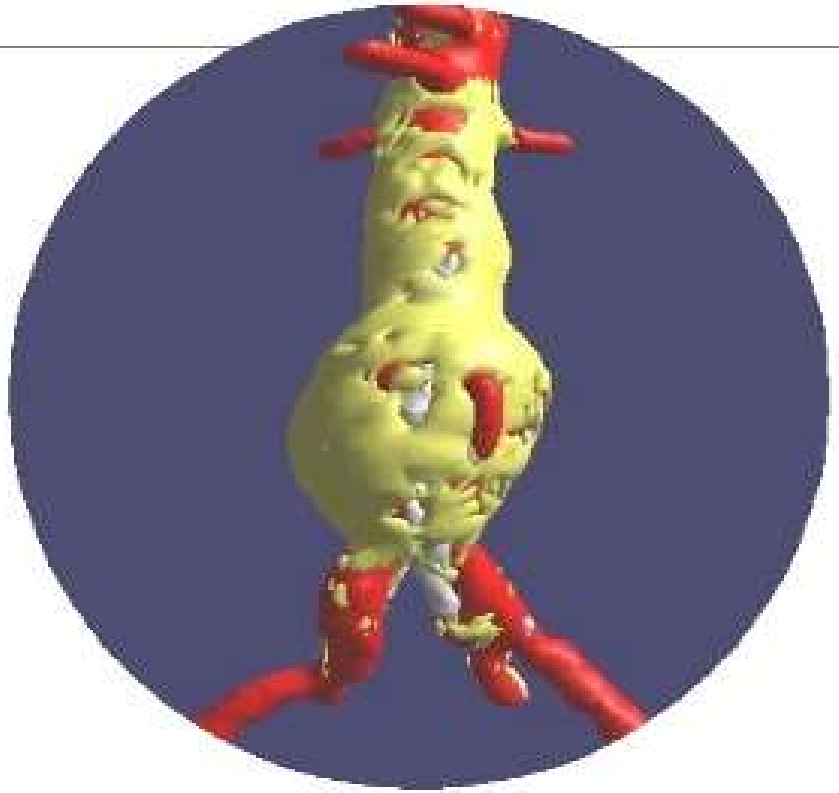
Aorta with an abdominal aneurysm

Why are AAAs a serious healthcare issue?

- An estimated **80** million people aged 60 years and older are at risk in **Western Europe**.[2]
- AAA is the 12th leading cause of death in Western societies.[3]
- It is a silent killer because there are often no symptoms that an aneurysm is developing in the abdominal aorta.

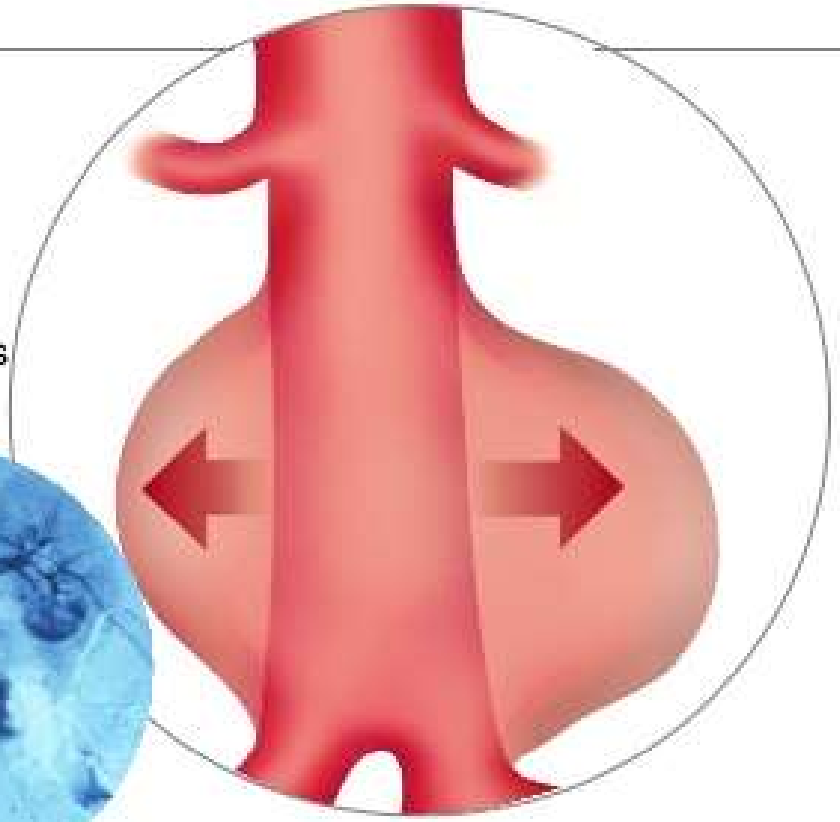
Pathophysiology of a AAA – risk factors

- Main risk factors are [23-25]
  - Male
  - Smoking history
  - Hypertension
  - Family history
  - Increasing age
  - Atherosclerosis
  - COPD
  - Infection/inflammation



Pathophysiology of a AAA

- Pathological changes in the aortic wall:
  - Inflammatory process
  - Causing breakdown of elastic elements
  - Decrease tensile strength
  - Leading to expansion



Types of AAA

- **Morphological Classification** [27]
  - True aneurysm
    - Fusiform aneurysms
    - Saccular aneurysms
  - Pseudo-aneurysms

Abdominal Aortic Aneurysm

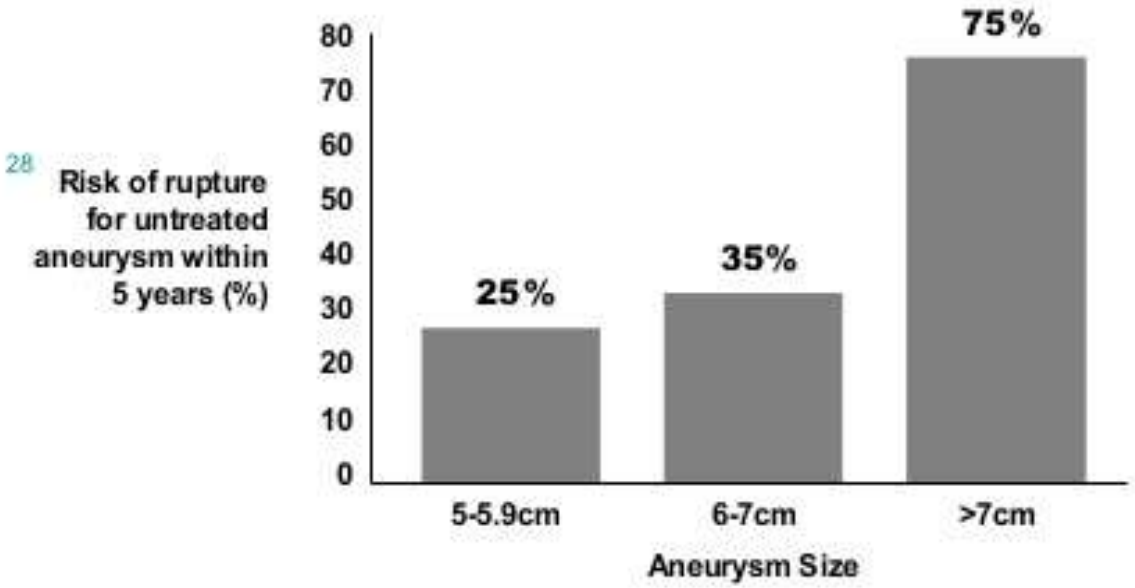
Why is early diagnosis of AAA so important?

- The operative mortality of treating a ruptured aneurysm is **80%** [4-10]
- For elective AAA cases, the operative mortality rate is drastically reduced, approximately only **2-7%** of cases result in death.[11-12]
- AAA ruptures can be avoided by identifying the population at risk and conducting simple and inexpensive ultrasound examinations.

Who are the patients at risk?

- AAA primarily affects people over 60 years old and are more common in men than in women.
- Other main risk factors include:
  - Smoking history
  - Hypertension
  - Family history of AAA

If untreated, the AAA may rupture



When the aneurysm diameter reaches 5cm, the risk of rupture is generally considered to be higher than the operative risk.

How can you diagnose a AAA?

- Ultrasound scan has proven to be a reliable and cost-effective way to diagnose a AAA.
  - It is an extremely sensitive test for all AAA sizes.[31]
  - It is painless and non-invasive.
  - It is cost-effective.[32]

What if a AAA is diagnosed?

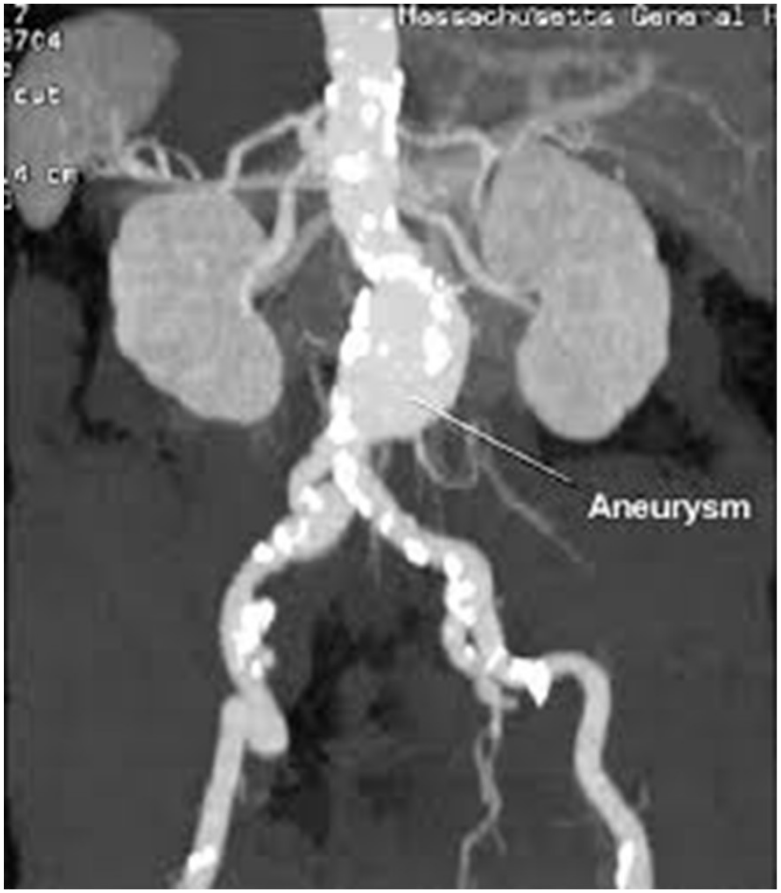
- Clinical practice suggests that:

Aneurysm diameter	Follow-up action
Less than 4cm	Recall annually
More than 4cm and less than 5cm	Recall every 6 months
More than 5cm or symptomatic or growing by more than 1cm per year	Endovascular or surgical management

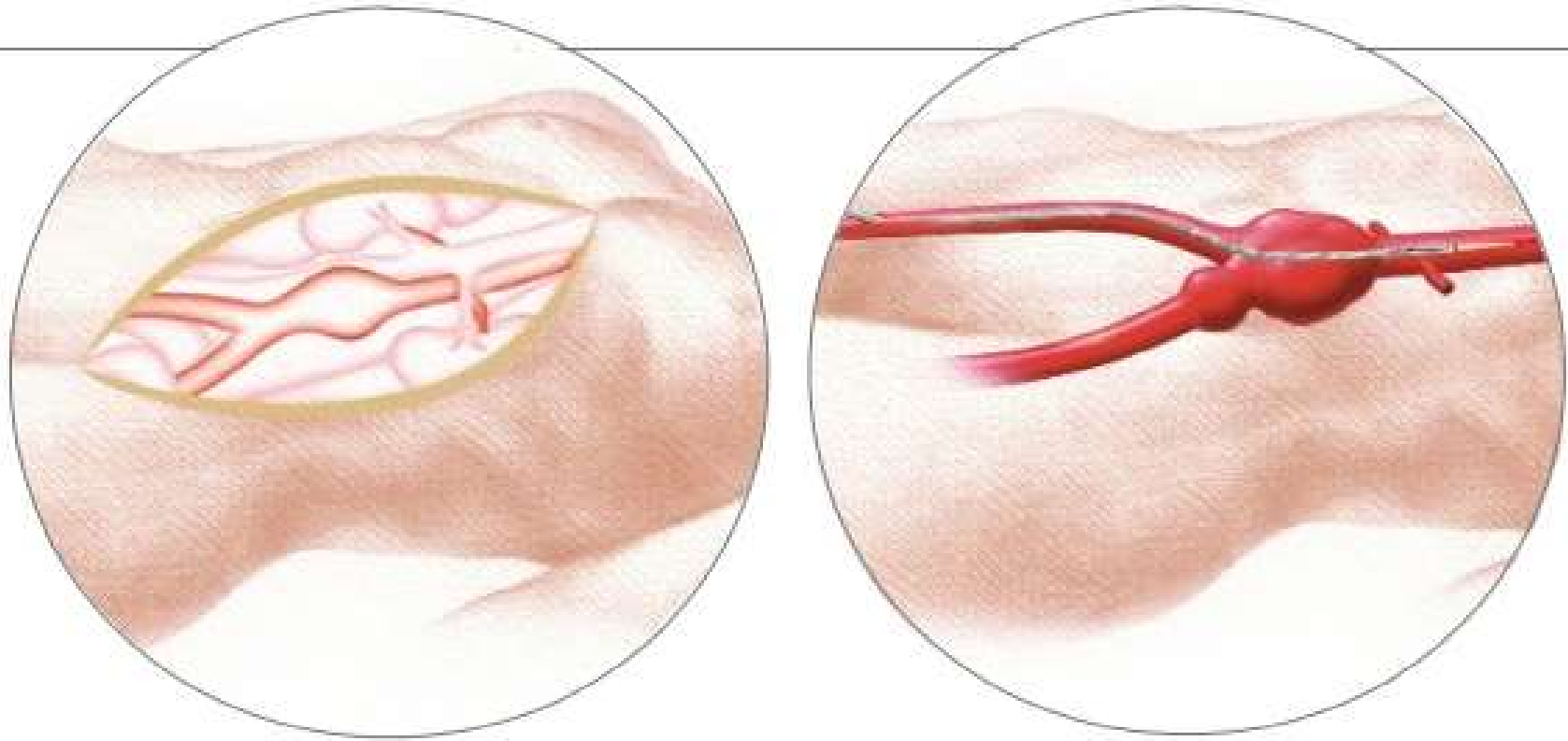
Table based on protocols used in various AAA patient screening programs.[33-38]
Follow-up recommendations may vary. Please contact your vascular specialist for more information.

>5cm AAA

- CT SCAN



2 Treatment options

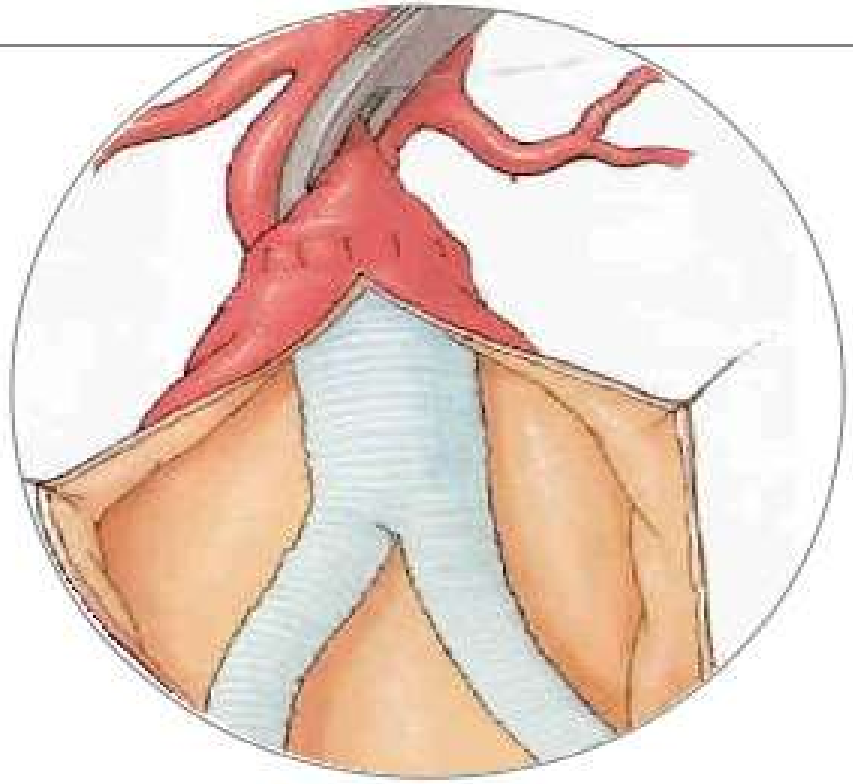


Open Surgery

Endovascular Stent Grafting

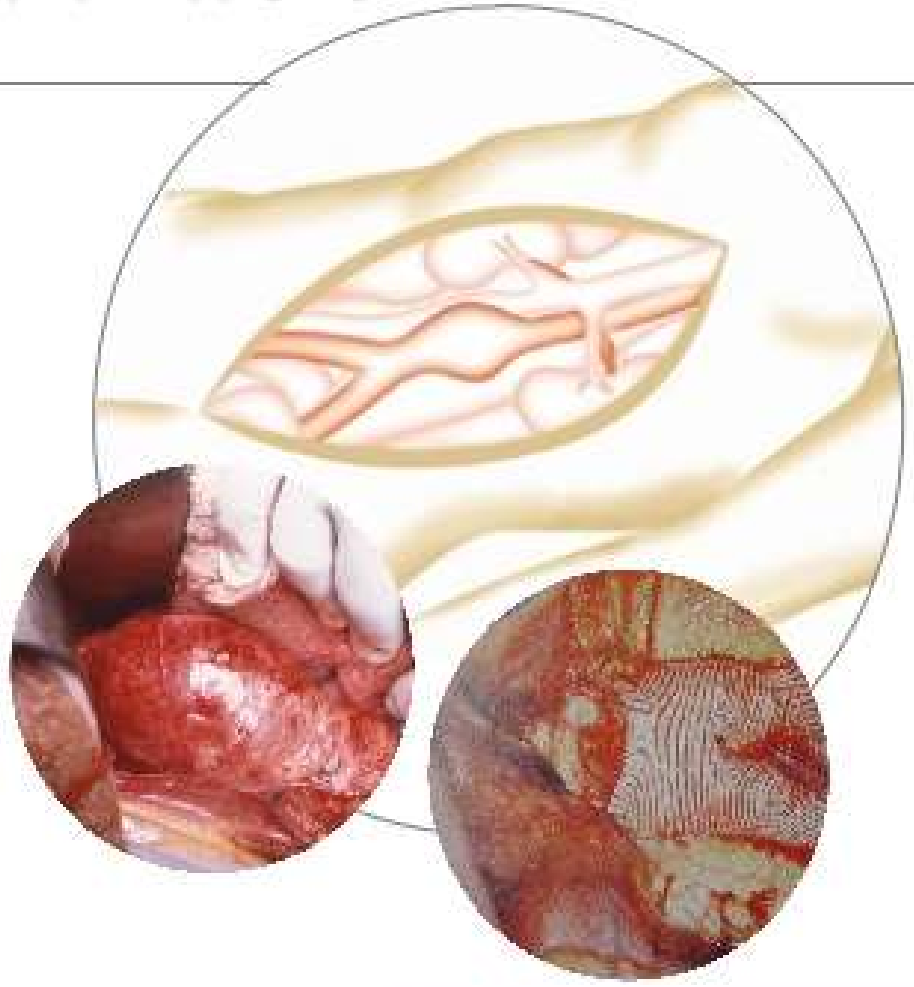
Open surgical repair: advantages

- Aneurysm opened, graft sewn in, aorta wrapped and closed around graft
- Established procedure (with more than 40 years of clinical experience)
- Excludes aneurysm and prevents sac growth
- Proven, long-term results



Open surgical repair: drawbacks[39-40]

- Significant incision in the abdomen
- 30–90 minute cross-clamp
- Up to 4-hour procedure
- Contraindicated in some patients
- 1–2 days intensive care
  5-7 days hospitalization
  4–6 weeks recovery time



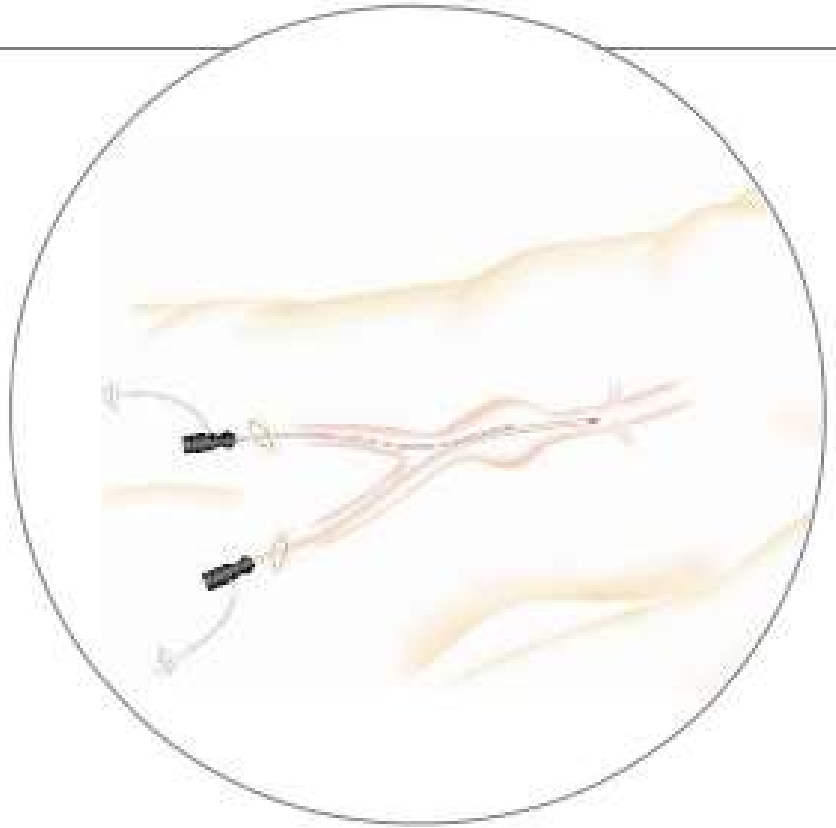
Abdominal Aortic Aneurysm

Open surgical repair: drawbacks

- Many patients considered "unfit" :
  - High anesthesia risk
  - Significant co-morbidities
  - Previous abdominal surgery/hostile abdomen
- Difficult recovery for patient:
  - Risks losing independence[41]
  - High perioperative[41] morbidity
  - 5% risk of mortality[42]

Endovascular stent grafting: advantages

- **Benefits** [44]
  - Minimally invasive
  - Reduced risk of death
  - Faster recovery
  - Improved functional outcomes

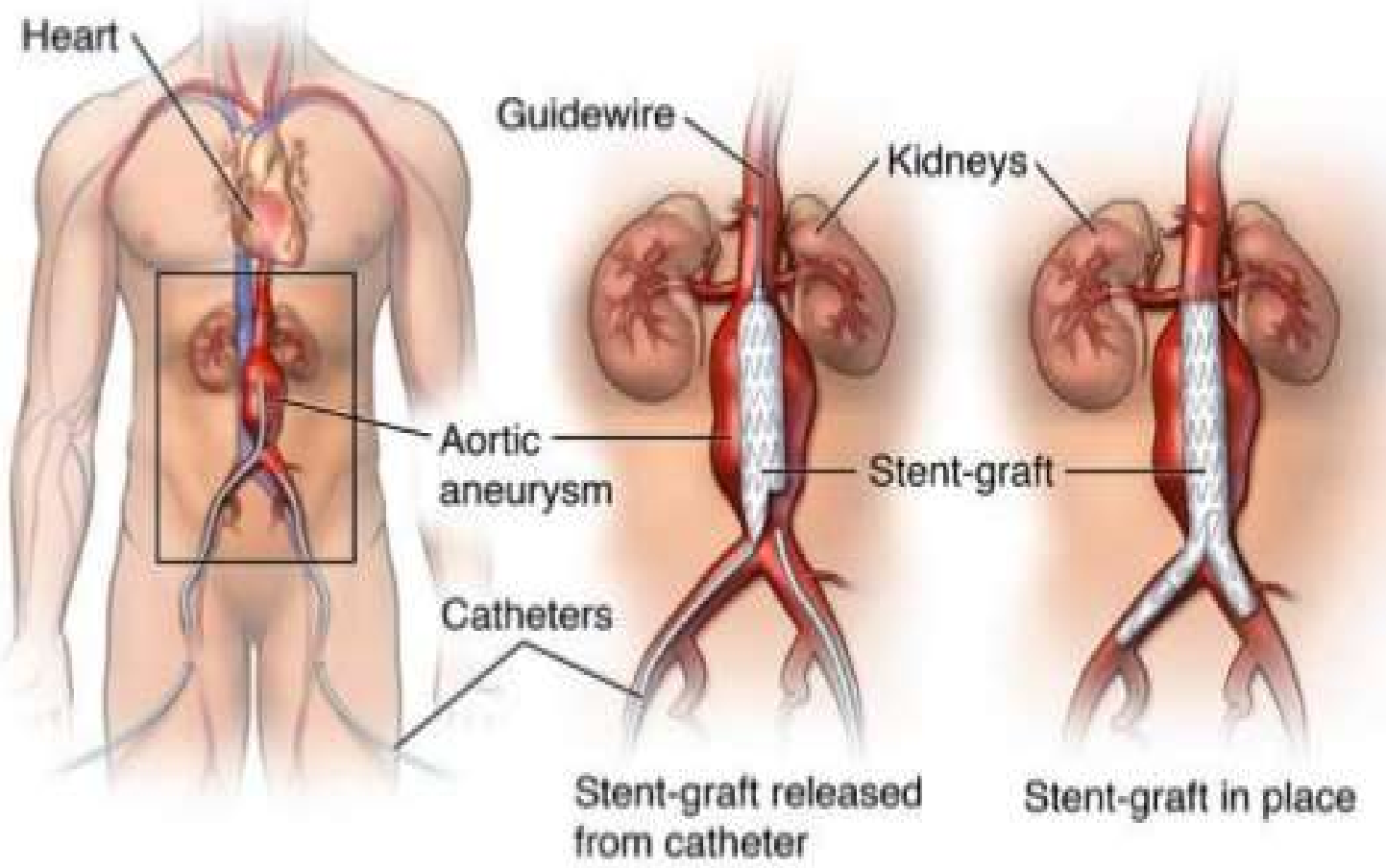


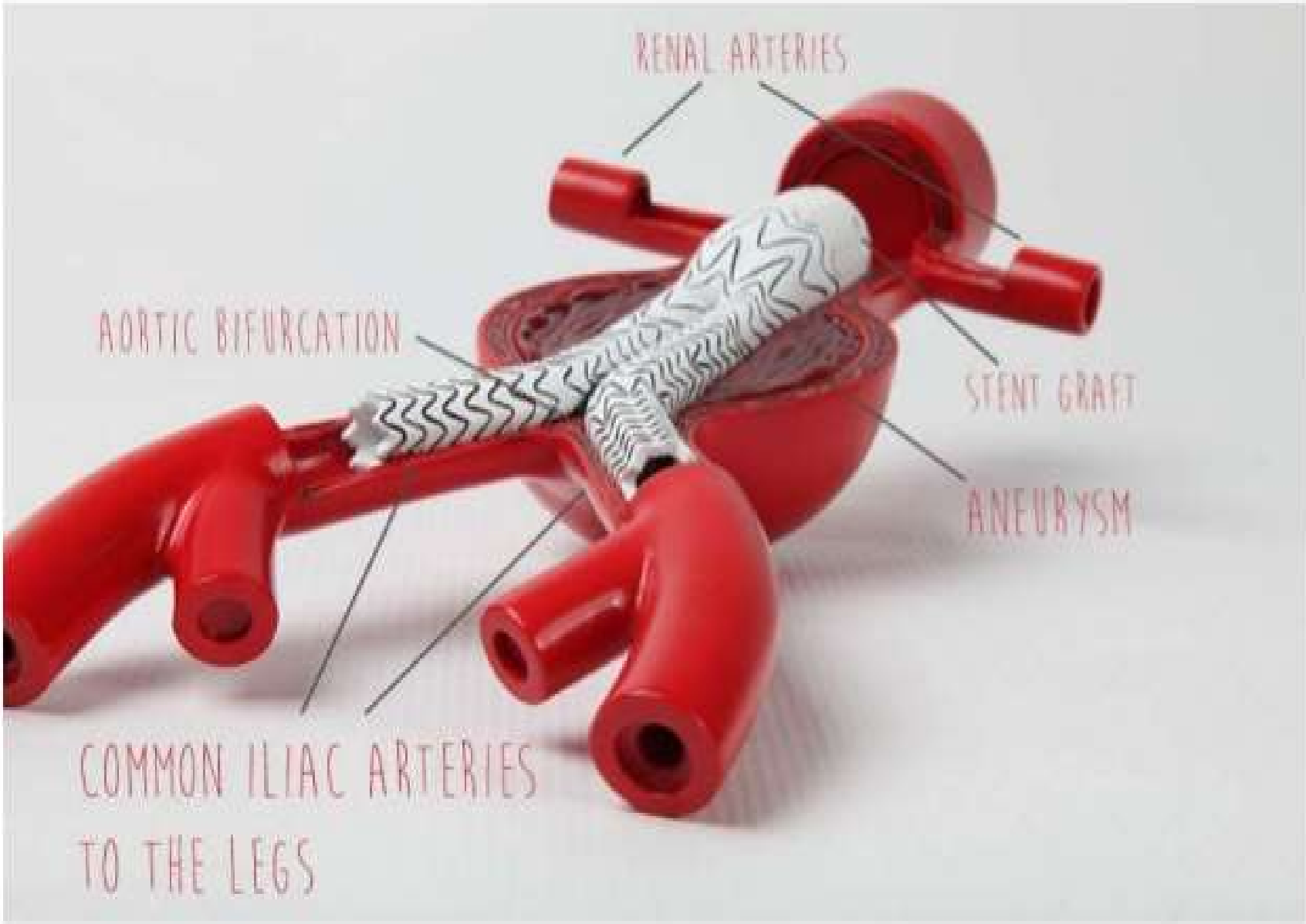
Endovascular stent grafting: drawbacks

Drawbacks [45]

- Complications and re-interventions:
  - Endoleaks
  - Stent graft migration
  - Modular dislocation
- Most complications are benign and treatable by endovascular techniques.
- New stent graft generations are associated with fewer complications.[45]

Endovascular aneurysm repair (EVAR), abdominal aortic aneurysm (AAA)




RENAL ARTERIES
AORTIC BIFURCATION
STENT GRAFT
ANEURYSM
COMMON ILIAC ARTERIES
TO THE LEGS

Endovascular stent grafting

- Morphology suitable for endovascular repair
  - Adequate vascular access
  - Appropriate landing zones
  - Tortuosity, calcification, thrombus
- Precise sizing
  - 3mm CT scan slices
- Good imaging equipment in the lab or in the operating room

Ruptured Abdominal aortic aneurysm (RAAA)

- Ruptured AAA presents with a classical triad of **pain** in the flank or back, **hypotension** and a **pulsatile abdominal mass**; however, only about half have the full triad. **Tachycardia** develops. **Shock** may occur.

- The patient will complain of the pain and may **feel cold, sweaty** and **faint on standing.**

- The following symptoms are listed with approximate frequency of presentation
  - **Abdominal pain (60%)**
  - **Back pain (70%)**
  - **Syncope (30%)**
  - **Vomiting (20%)**

RUPTURED ABDOMINAL AORTIC ANEURYSM

Abdominal aortic aneurysm (AAA) - sites of rupture and their incidence

- Intraperitoneal rupture (20%)
- Retroperitoneal rupture (80%)
- Aortocaval fistula (3–4%)
- Primary aortoduodenal fistula (<1%)
- Rarely, Into the abdominal veins or the bowel.

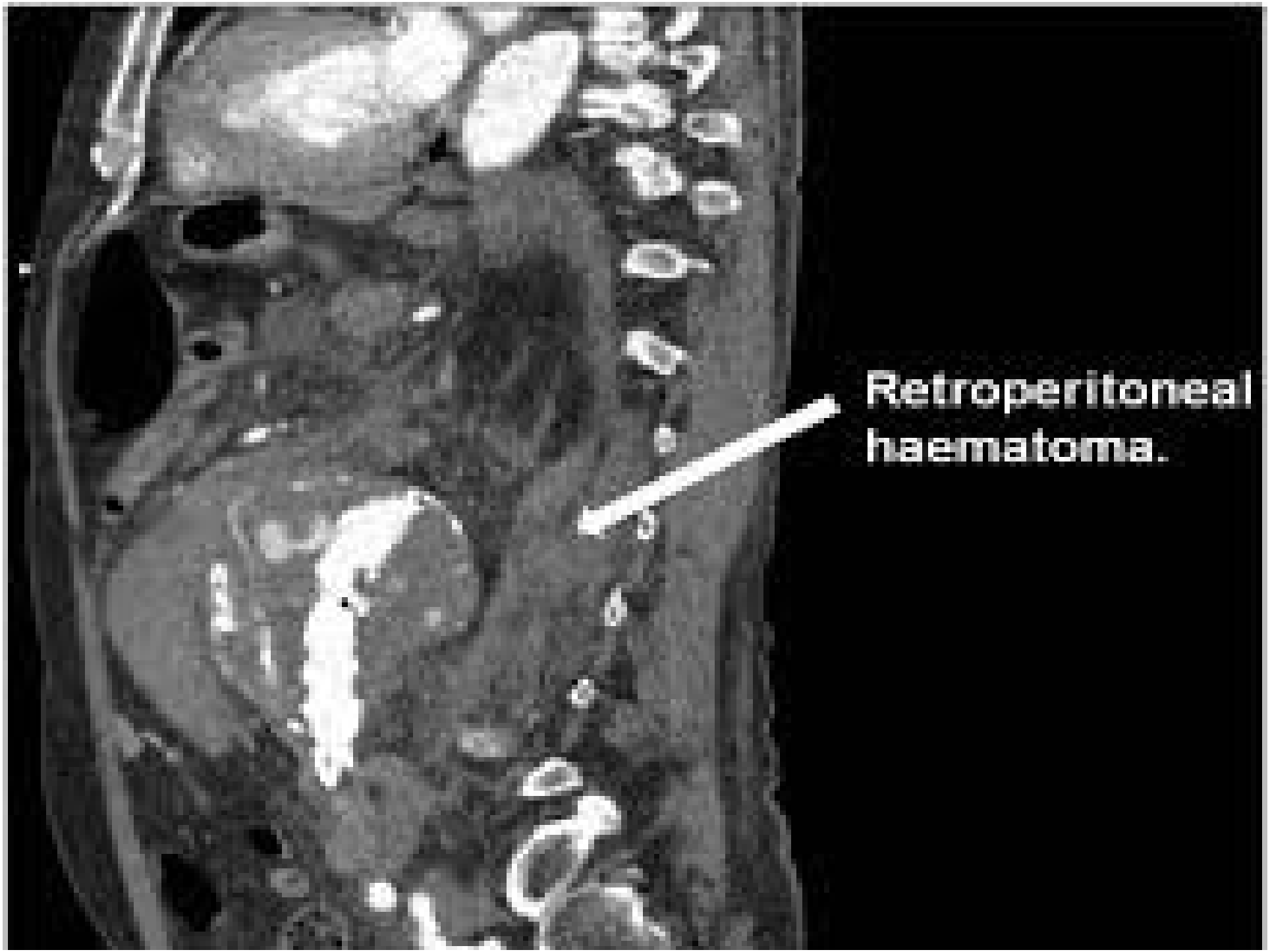
Aortocaval fistula

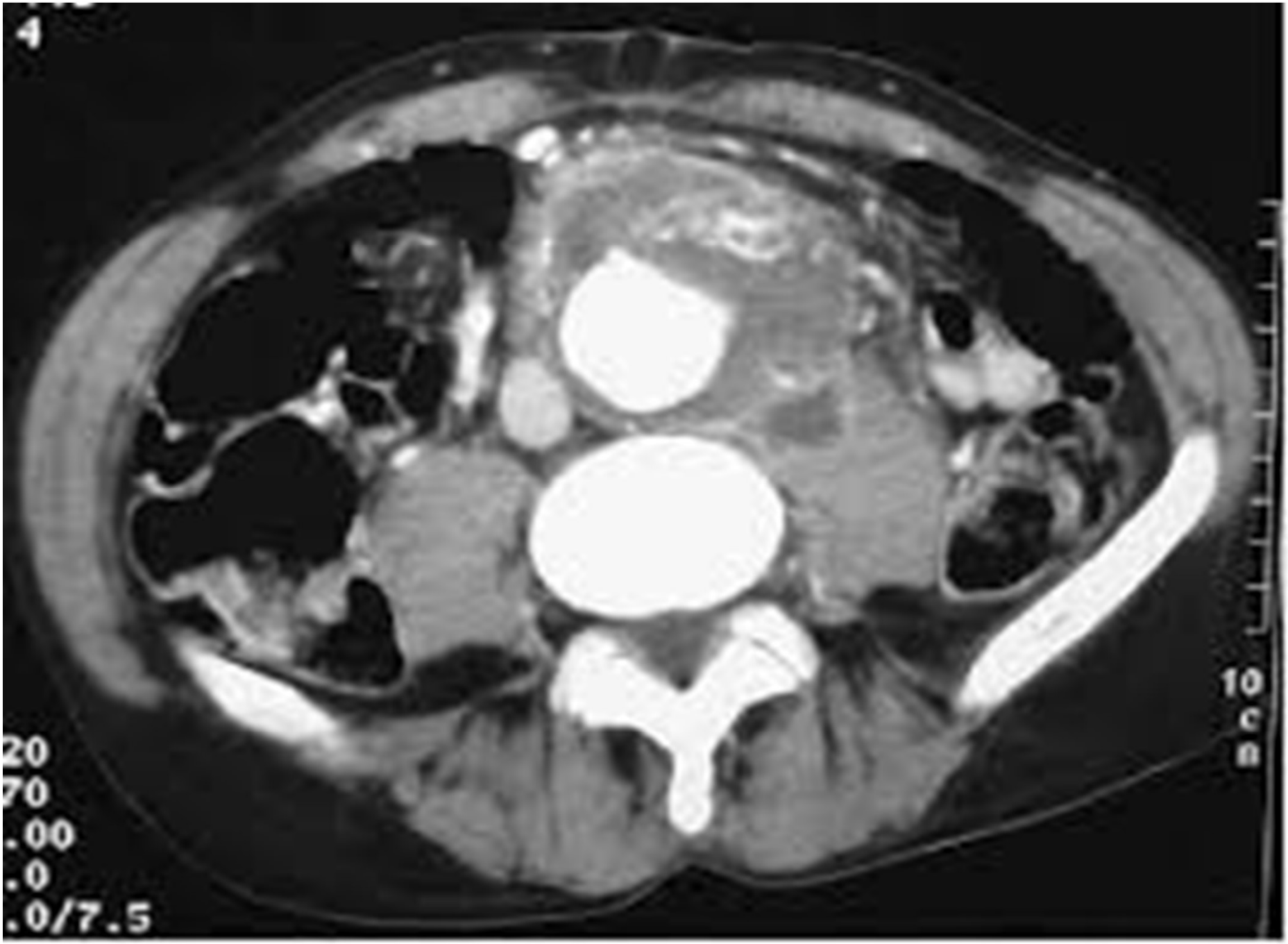
- A spontaneous aortocaval fistula most commonly occurs when an **AAA erodes (ruptures) into the inferior vena cava**
- Approximately 3–4% of patients with ruptured AAA have an aortocaval fistula.
- In these patients, the manifestations of rupture usually dominate the clinical picture and significantly **diminish the chance of preoperative diagnosis.**
- Aortocaval fistulae are probably **missed in 50%** of patients and are **discovered accidentally during elective repair of AAA.**
- **Trauma and surgery of the lumbar spine** are other known causes of aortocaval fistulae.
- The manifestations of an aortocaval fistula are variable because they depend on the size of the communication between the aorta and the inferior vena cava.
- Thus, temporary or permanent closure of this communication by an aortic mural thrombus or by a compressing aneurysm will change the clinical picture.

Diagnosis of rAAA

- Clinical suspicion.
- Classical tried.
- Urgent CT SCAN
- Contrast or non contrast.

Fig 1


Retroperitoneal
haematoma.


4
10 cm
20
70
.00
.0
.0/7.5

Resuscitation for rAAA

- Hypotensive resuscitation.
- Mean BP 80mmhg.
- 2 wide bore IVI Lines.
- Urinary catheter
- 4 unit blood .

Once Diagnosed rAAA

- Decision to approach.
- Suitable anatomy proceed for EVAR.
- Anatomy not suitable open repair .

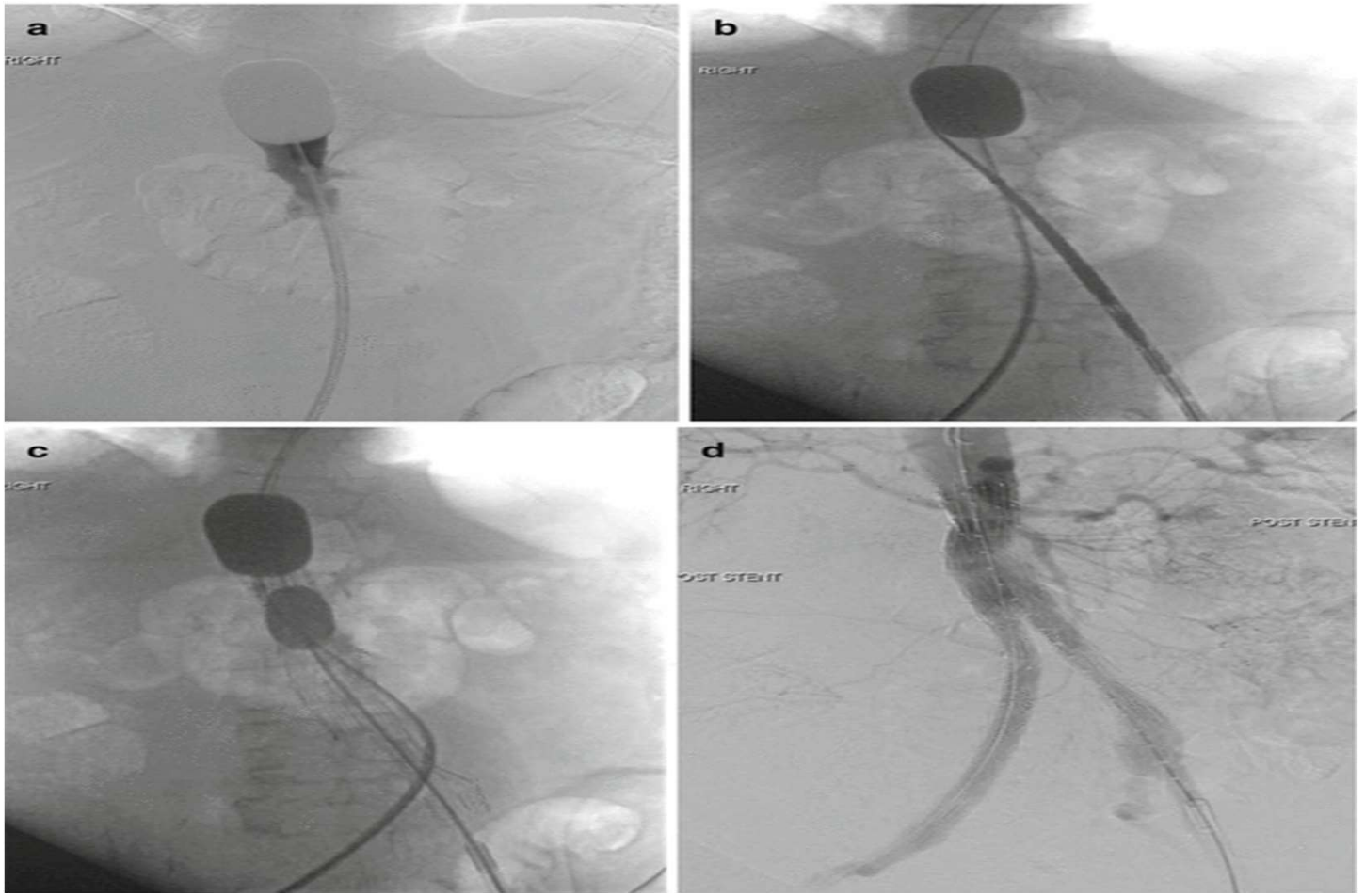
Suitable Anatomy rAAA

- Infra Renal AAA.
- 1 to 1.5 cm neck (distance from renal to AAA).
- Adequate femoral and iliac access.
- Diameter of vessels.
- Angulation of vessels.

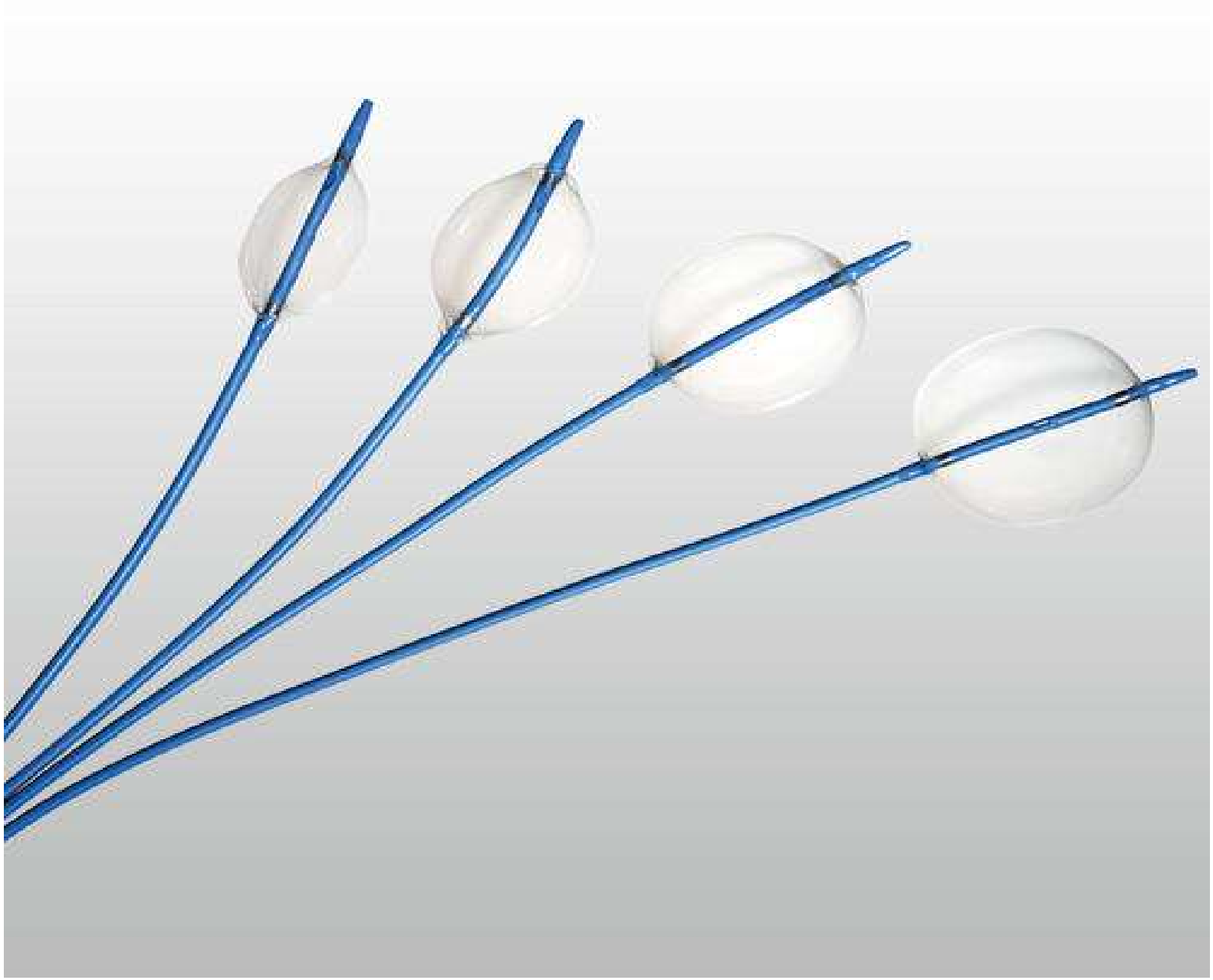
Advantage of EVAR in rAAA

- Done under local anesthesia.
- Femoral approach.
- Minimal blood loss.
- Better control on hemodynamics.
- Early recovery
-

Resuscitative Endovascular Balloon Occlusion (REBOA) AS an Adjunct



- Femoral access with 8F Sheath.
- Axillary access .
- Aortic Balloon should be above SMA or celiacA
- Balloon size .
- Avoid over inflation of balloon .
- Screening

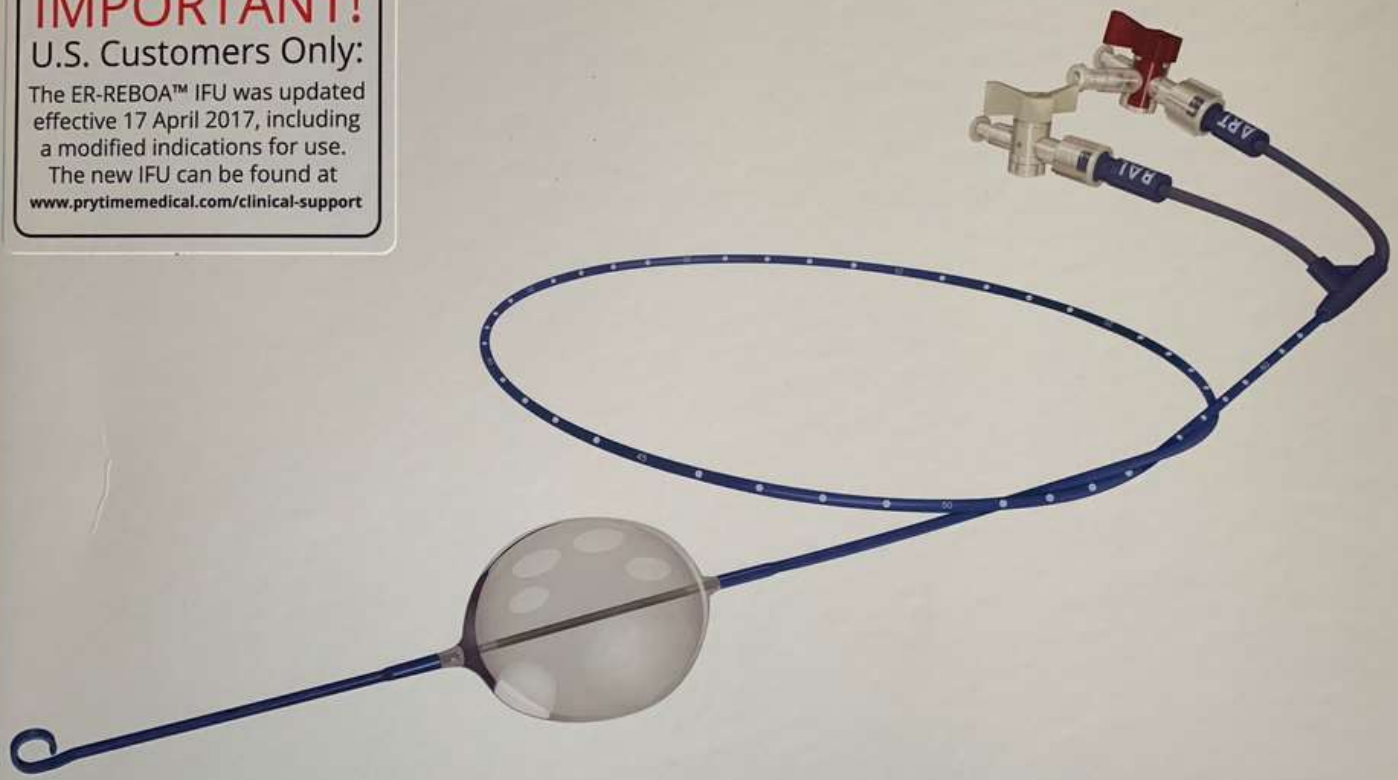


ER-REBOA™ CATHETER

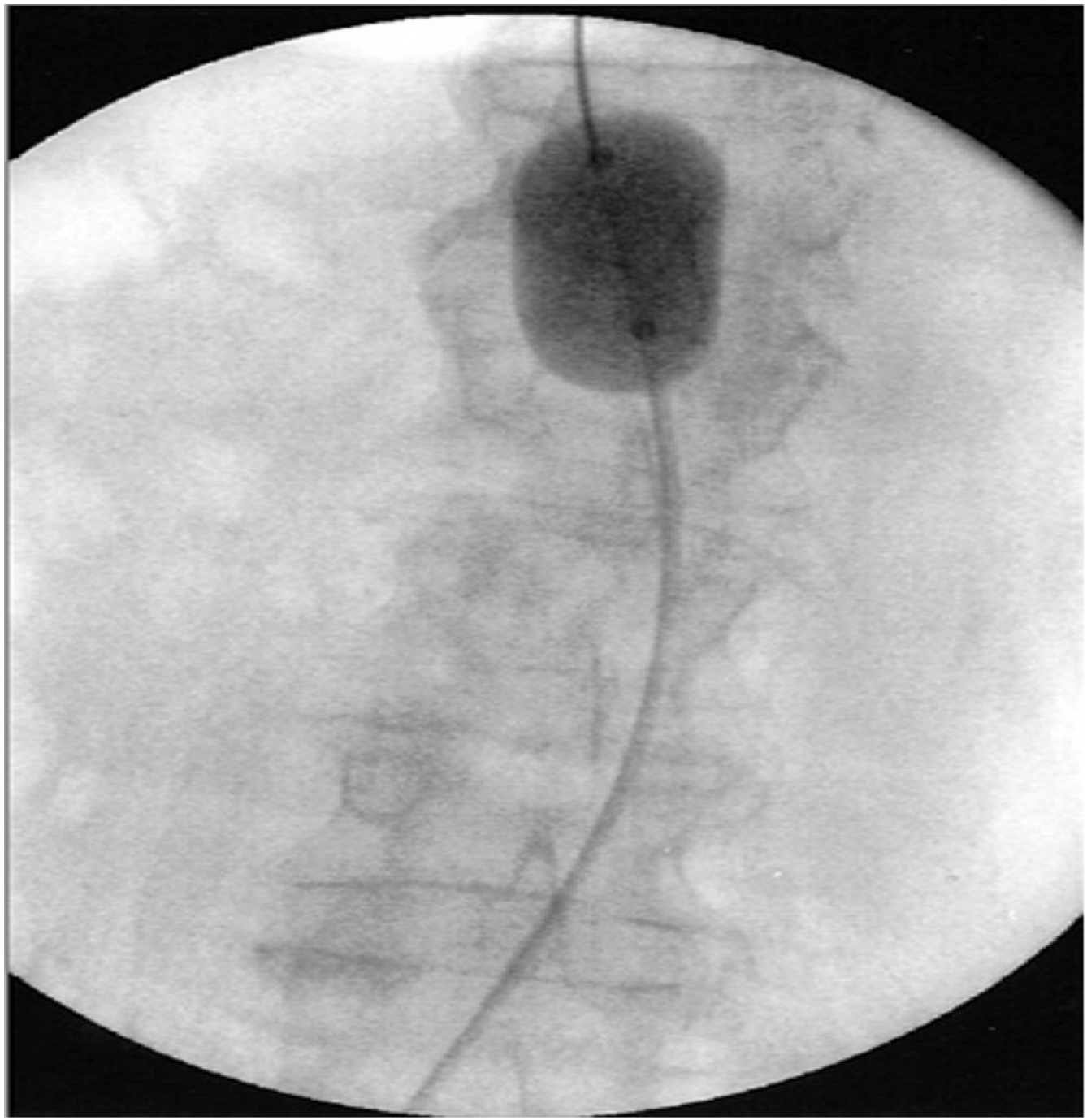
IMPORTANT!

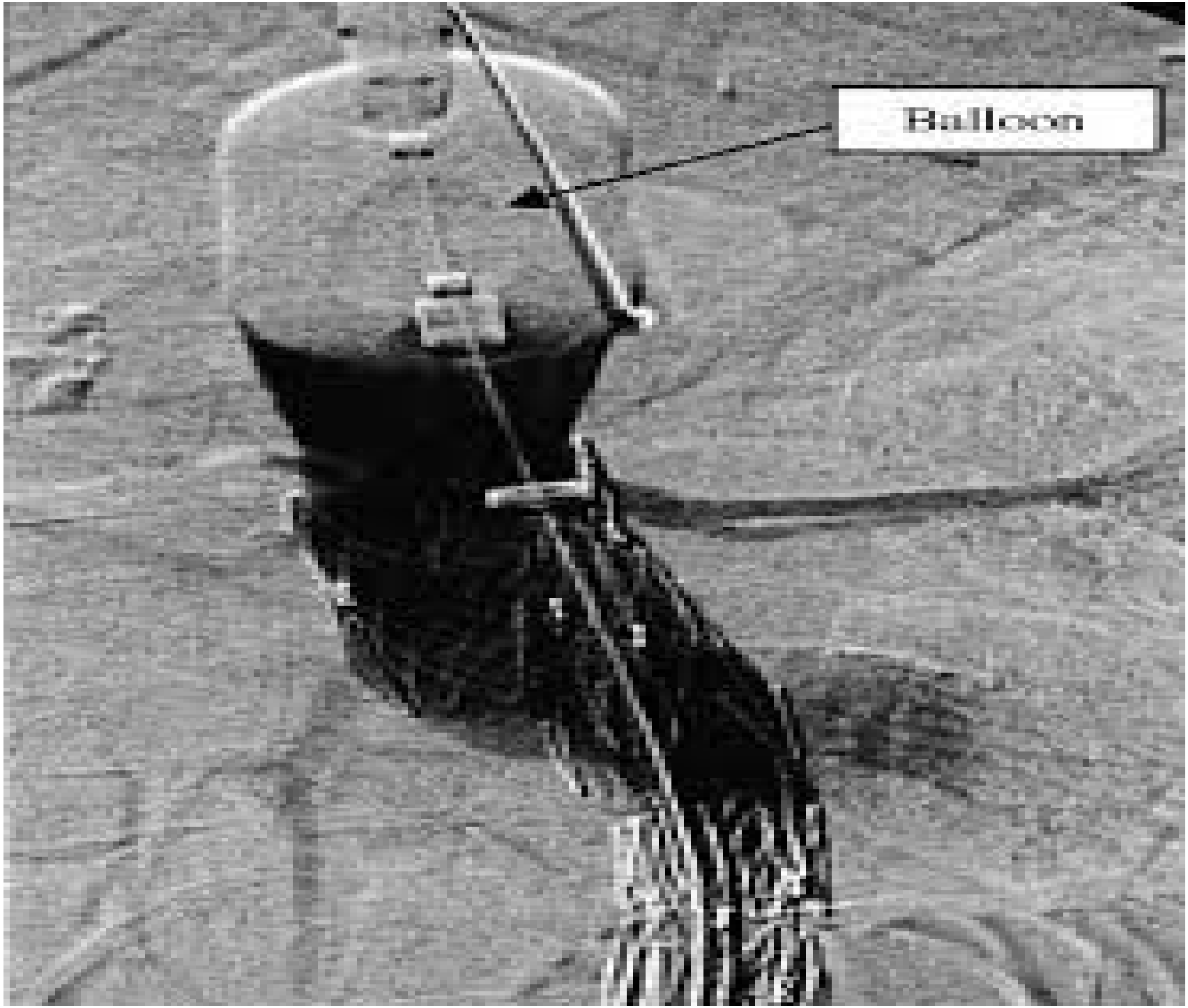
U.S. Customers Only:

The ER-REBOA™ IFU was updated effective 17 April 2017, including a modified indications for use. The new IFU can be found at **www.prytimemedical.com/clinical-support**



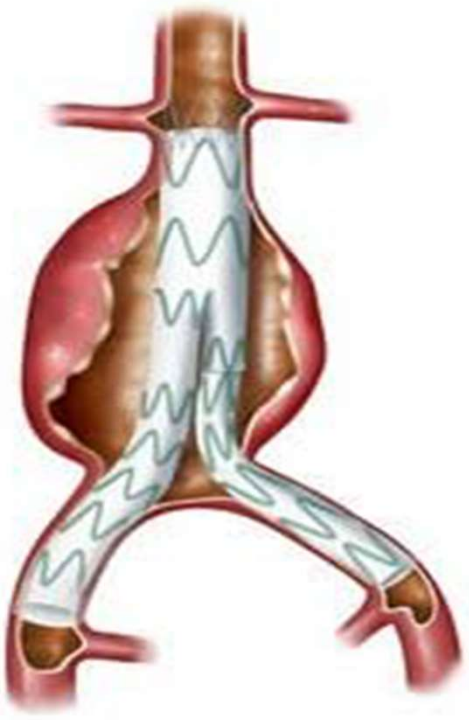
PRYTIME MEDICAL™
The REBOA Company™




Balloon

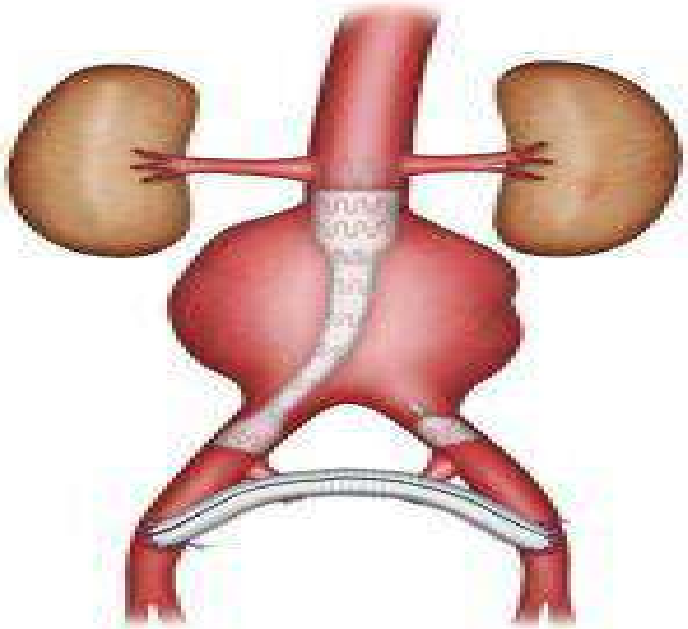
TYPES
OF Procedures in rAAA

- Classic Aorto Bi iliac stent graft.



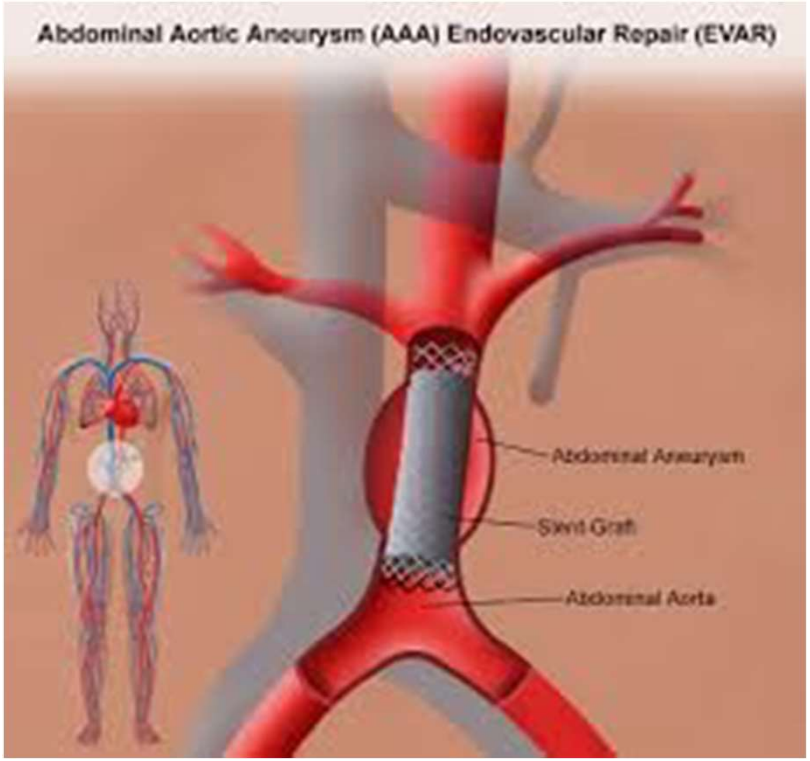
TYPES
OF Procedures in rAAA

- Aorto uni iliac stent graft.
- + Fem—Fem cross over bypass.
- Iliac embolization plug.



TYPES
OF Procedures in rAAA

- Aortic stent graft.
- Not in common practice




Rendering
No cut
cm

What Does the Current Evidence On EVARR For Ruptured AAA Tell Us

IMPROVE TRAIL

AJAX TRAIL

ECAR TRAIL

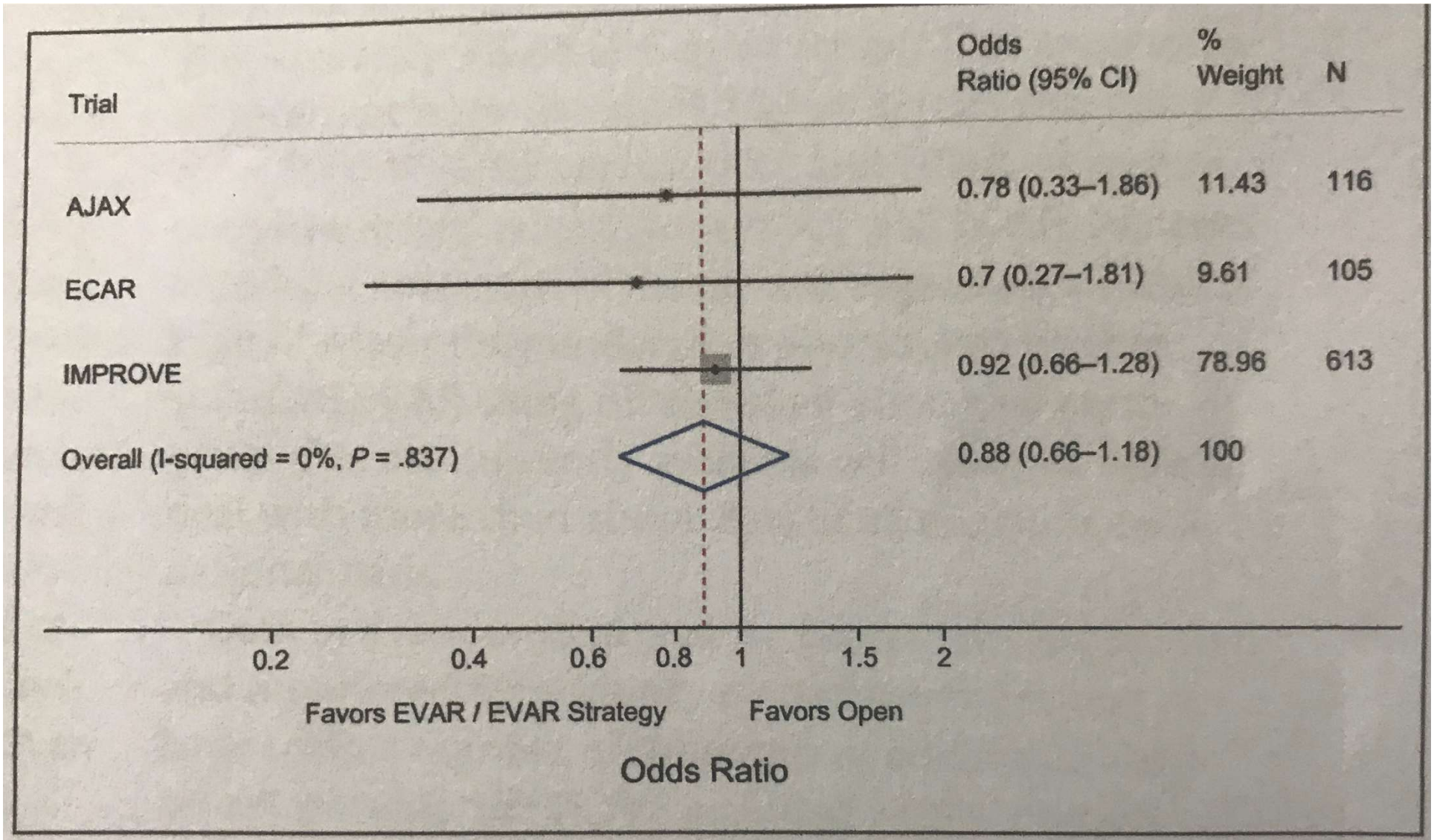


Figure 1. Thirty-day mortality by randomized group: individual patient meta-analysis from three trials.

EVAR Versus Open Repair for Ruptured Abdominal Aortic Aneurysms

Randomized trials have provided new evidence about outcomes in all patients with ruptured aneurysms, not just those anatomically suitable for EVAR.

BY ROBERT J. HINCHLIFFE, MD, FRCS, AND JANET T. POWELL, MD, PHD, FRCPATH

Randomized Trials Show EVAR Is the Best Option for Ruptured AAAs

The conclusion that IMPROVE, AJAX, and ECAR demonstrate that EVAR confers no survival benefit over open repair is misleading.

BY FRANK J. VEITH, MD, AND CARON B. ROCKMAN, MD

Thank you