



Endovaskulära operationsmetoder för trauma och blödningschock

Carl Magnus Wahlgren öl/adj prof/vc

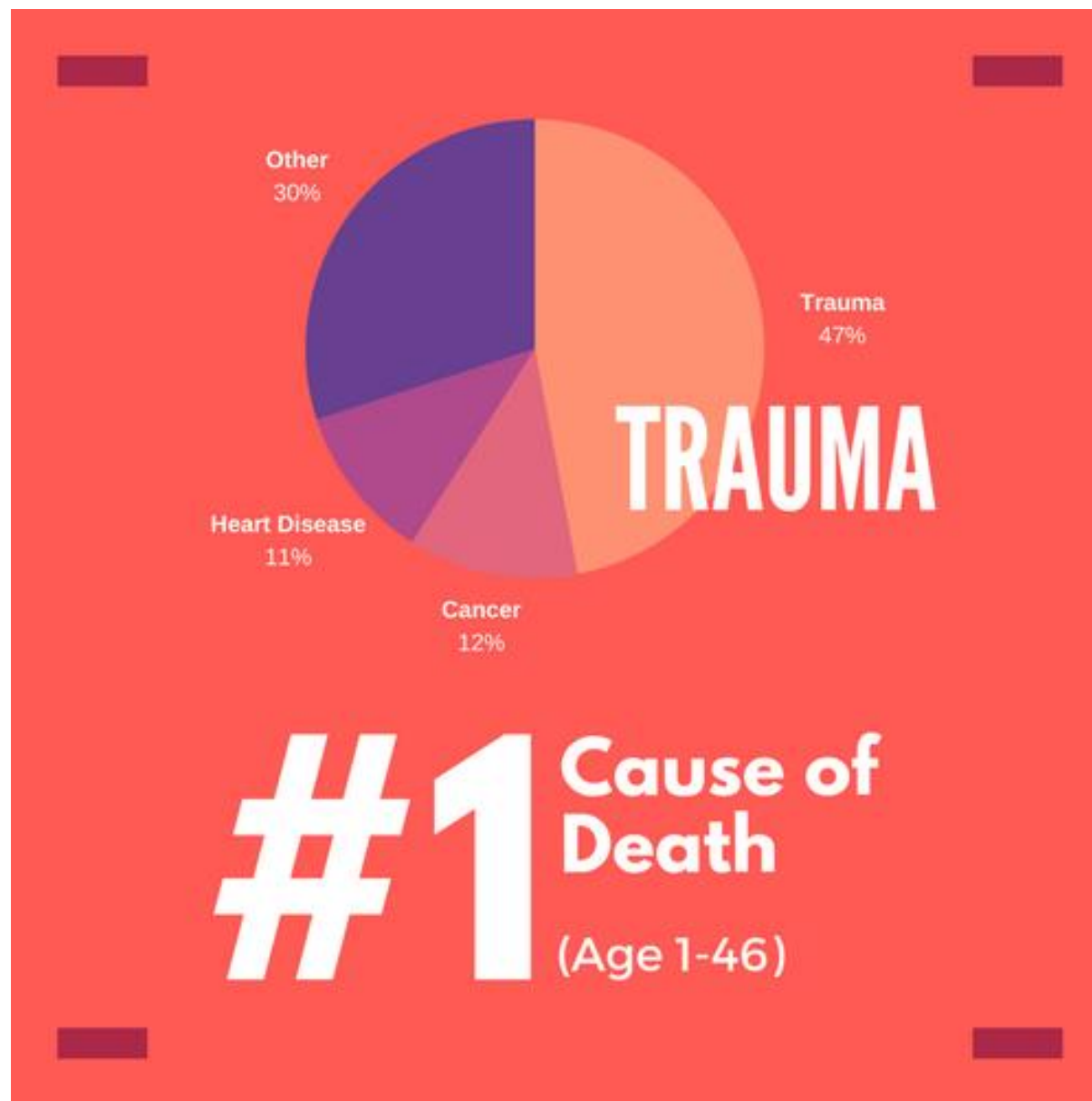
ME Kärlkirurgi

Karolinska Universitetssjukhuset

Traumatiska skador är ett globalt hälsoproblem



World Health
Organization



Cause of Hemorrhage	Deaths from Hemorrhage*	U.S. Cases of Hemorrhage		Global Cases of Hemorrhage	
		No. of Deaths per Yr	Yr of Life Lost	No. of Deaths per Yr	Yr of Life Lost
	<i>percent</i>				
Abdominal aortic aneurysm	100	9,988†	65,273‡	191,700§	2,881,760¶
Maternal disorder	23§	138	7,572**	69,690	4,298,240**
Peptic ulcer disease	60††	1,860	38,597**	141,000	3,903,600**
Trauma	30‡‡	49,440	1,931,786**	1,481,700	74,568,000**
Total		61,426	2,043,228	1,884,090	85,651,600



Traumatisk blödning ledande orsak till potentiellt undvikbar död hos skadade patienter

World Health Organization 2015

Blödning vanligaste orsaken till död första timmen efter ankomst till traumacenter

Kauvar J Trauma et al 2006

Hemorrhagic death

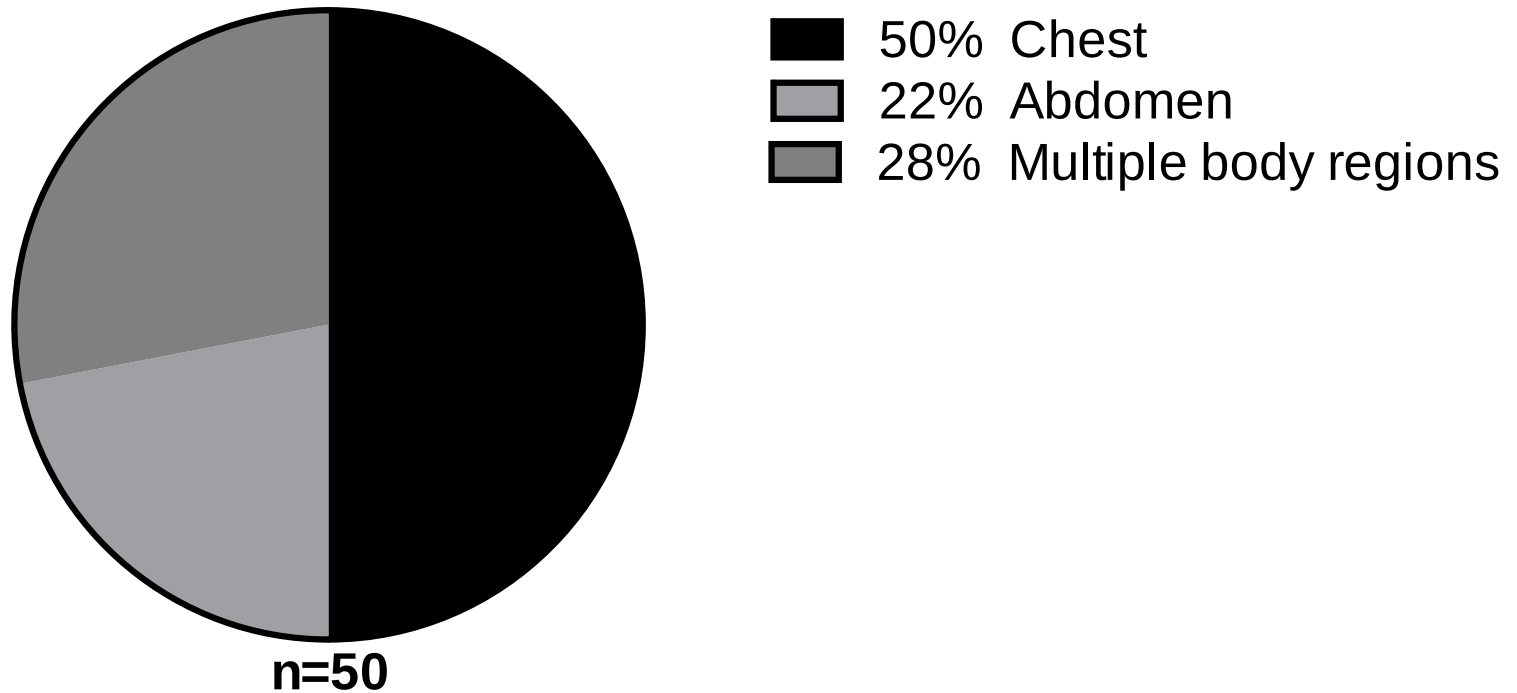
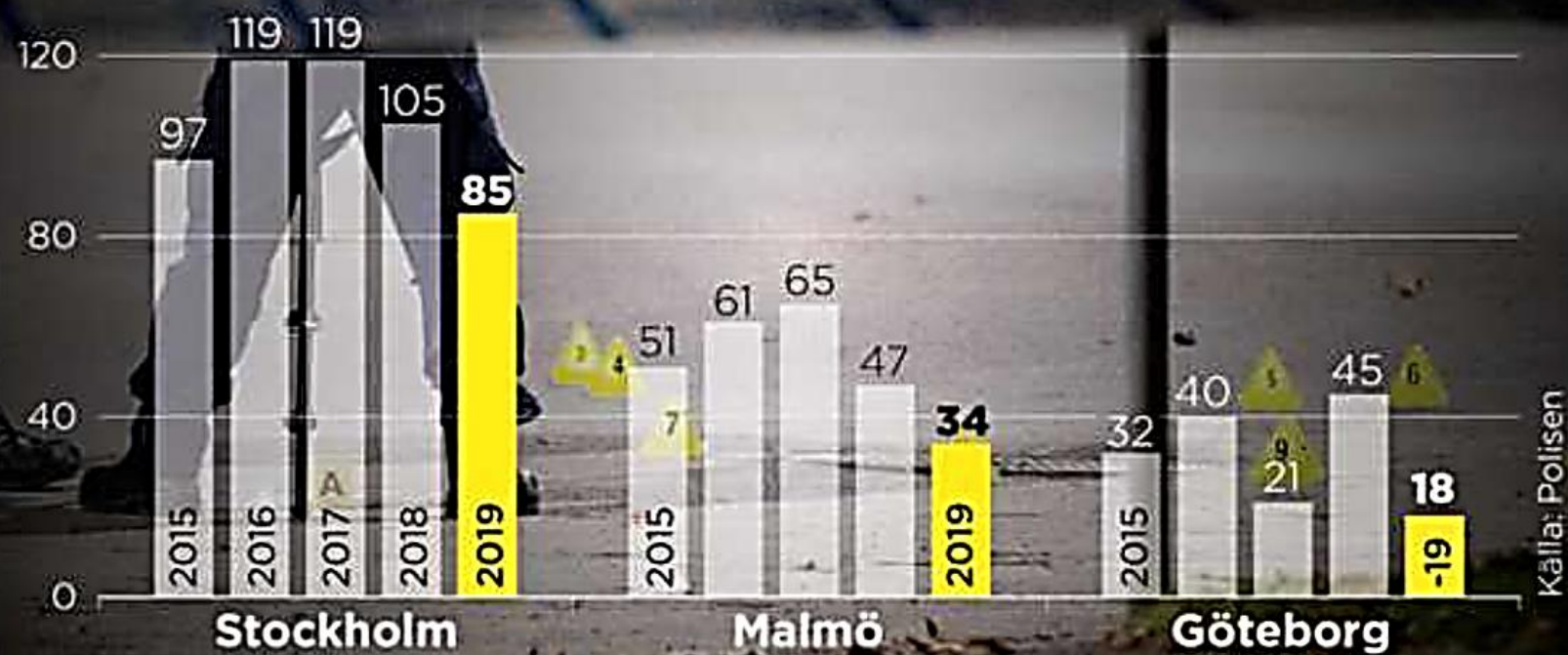
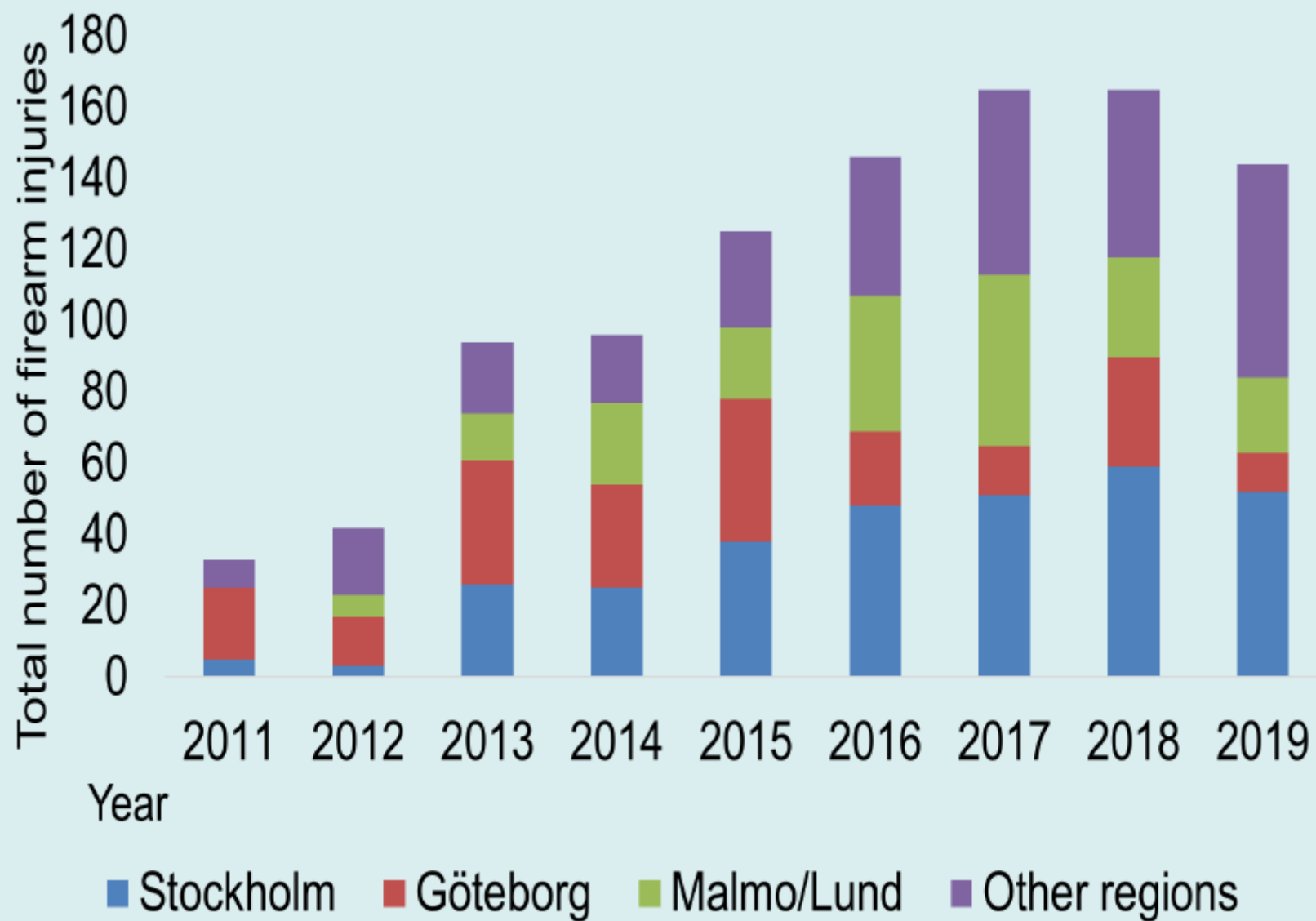


Figure 1. The major sources of hemorrhage

Antal skjutningar i storstäderna 2015-2019.



Aftonbladet jan 5 2020



Hemostatisk Resuscitering

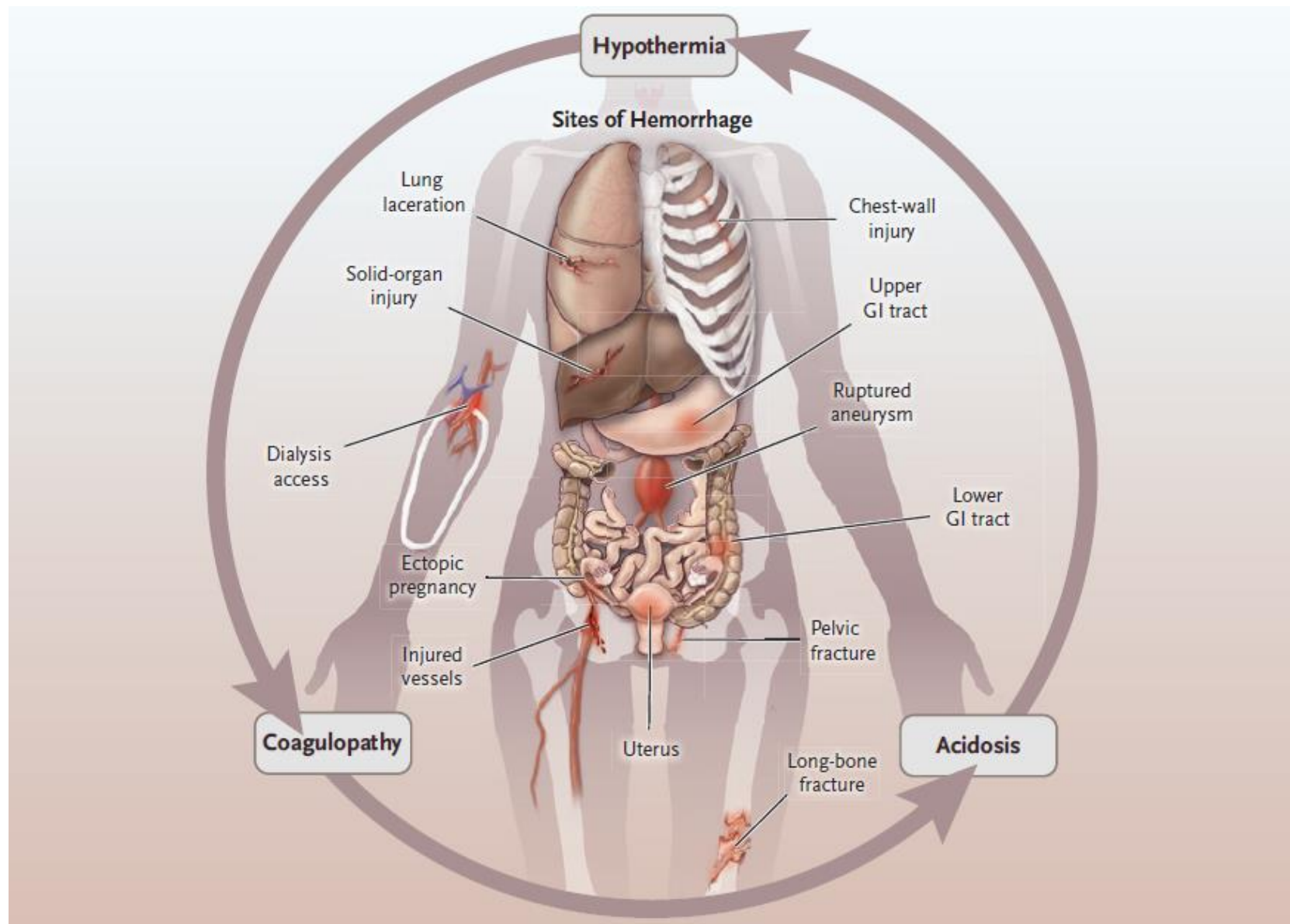
1) Tidig blödningskontroll (DCS)

2) Permissive hypotension

3) Begränsa vätskeinfusion (utspädning)

4) Massivt transfusionsprotokoll

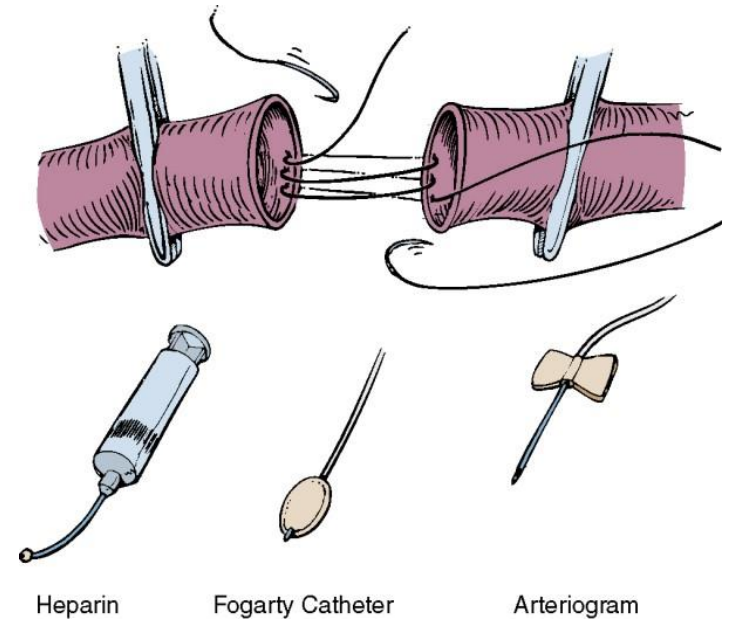
5) Behandla koagulopati



Cannon J; N Engl J Med 2018

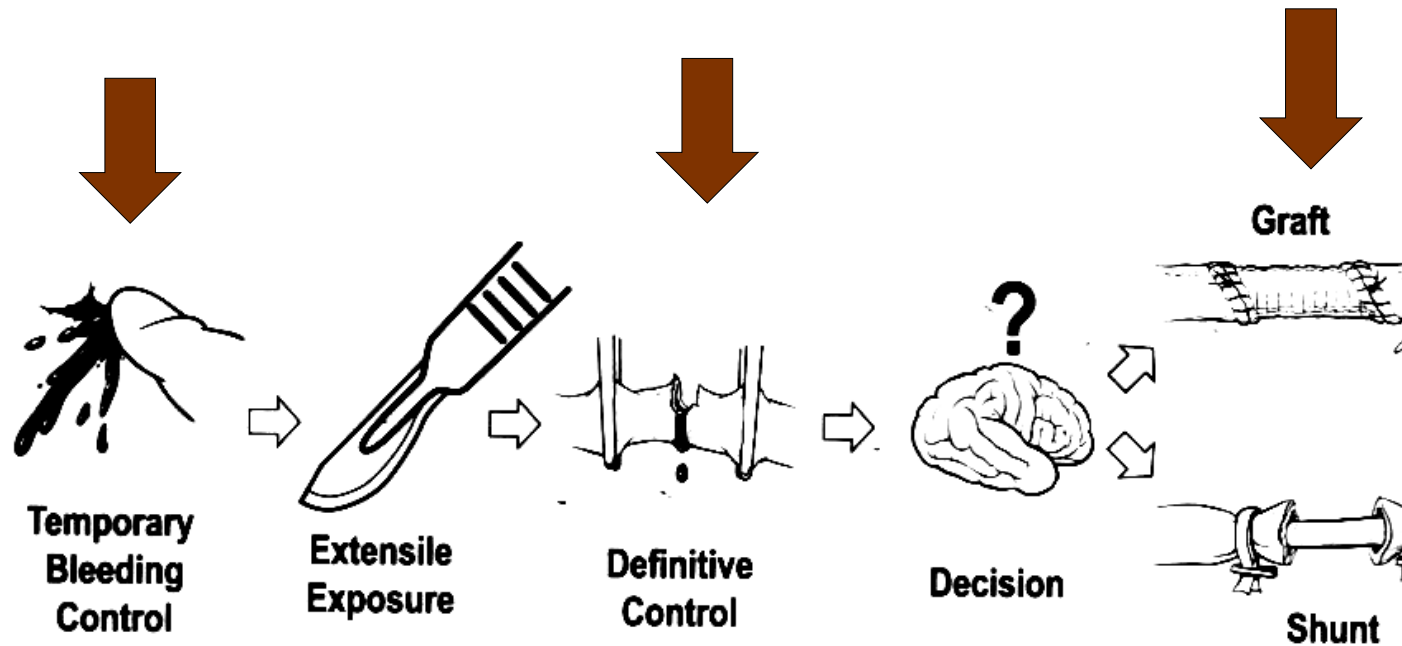
Kärltrauma

- Anatomi och Fysiologi
- Stoppa blödning
- Återställ cirkulation
- Vascular damage control



Skadekontroll Blödning

ENDOVASKULÄRT



Mattox; Hirschberg
Top Knife

Strategiska beslut

Ytterligare faktorer:

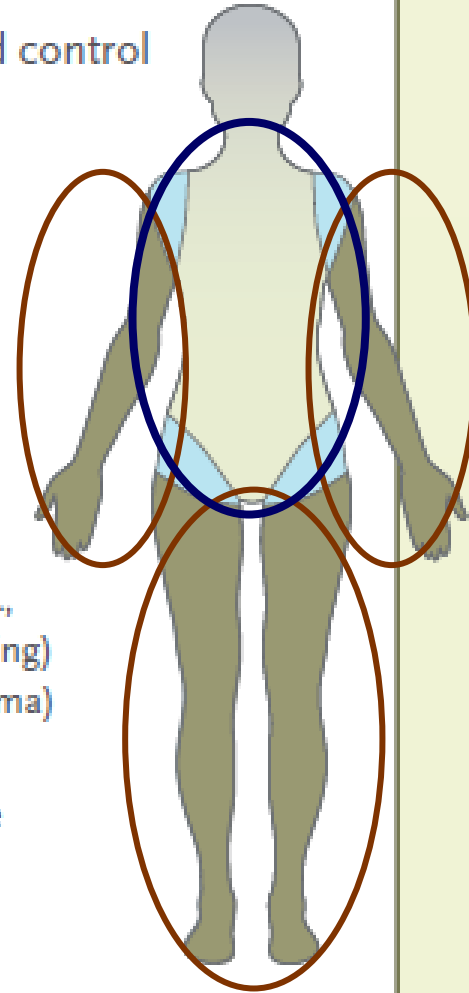
1. Patientens traumabörda och fysiologi
2. Cirkulatorisk instabil eller blöder från annan kavitet?
3. Erfarenhet? Finns hjälp?



Prehospital Interventions

Hemorrhagic identification and control

- **Compressible sites**
Use direct pressure or
tourniquet proximal to
bleeding site
- **Junctional sites**
Apply hemostatic
dressing
- **Noncompressible sites**
Signs may be obvious (e.g.,
in gastrointestinal bleeding)
or occult (e.g., after trauma)
Apply pelvic binder for
suspected pelvic fracture



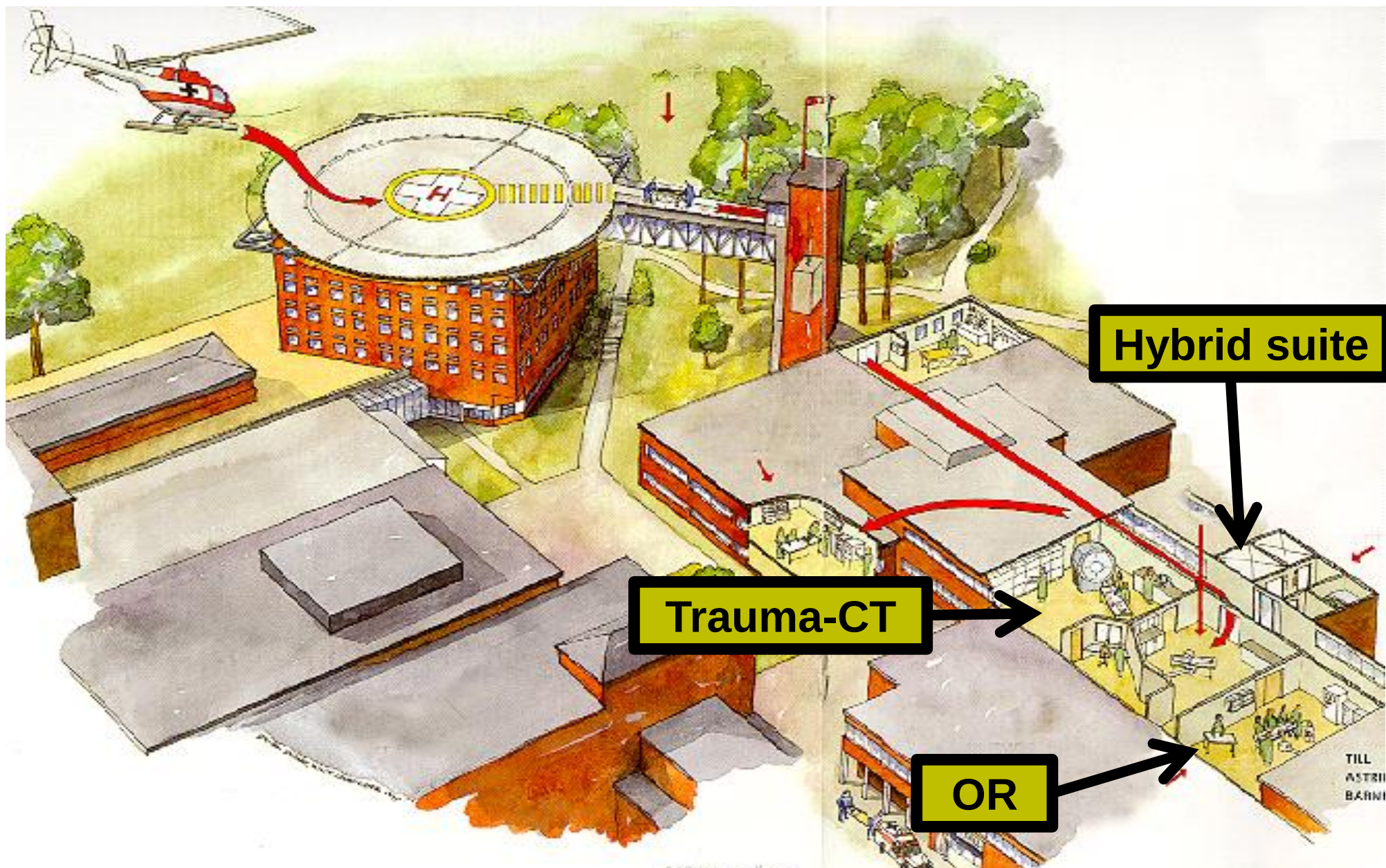
Limited resuscitation

Hypothermia prevention

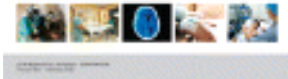
Rapid transport to medical facility



Cannon J; N Engl J Med 2018







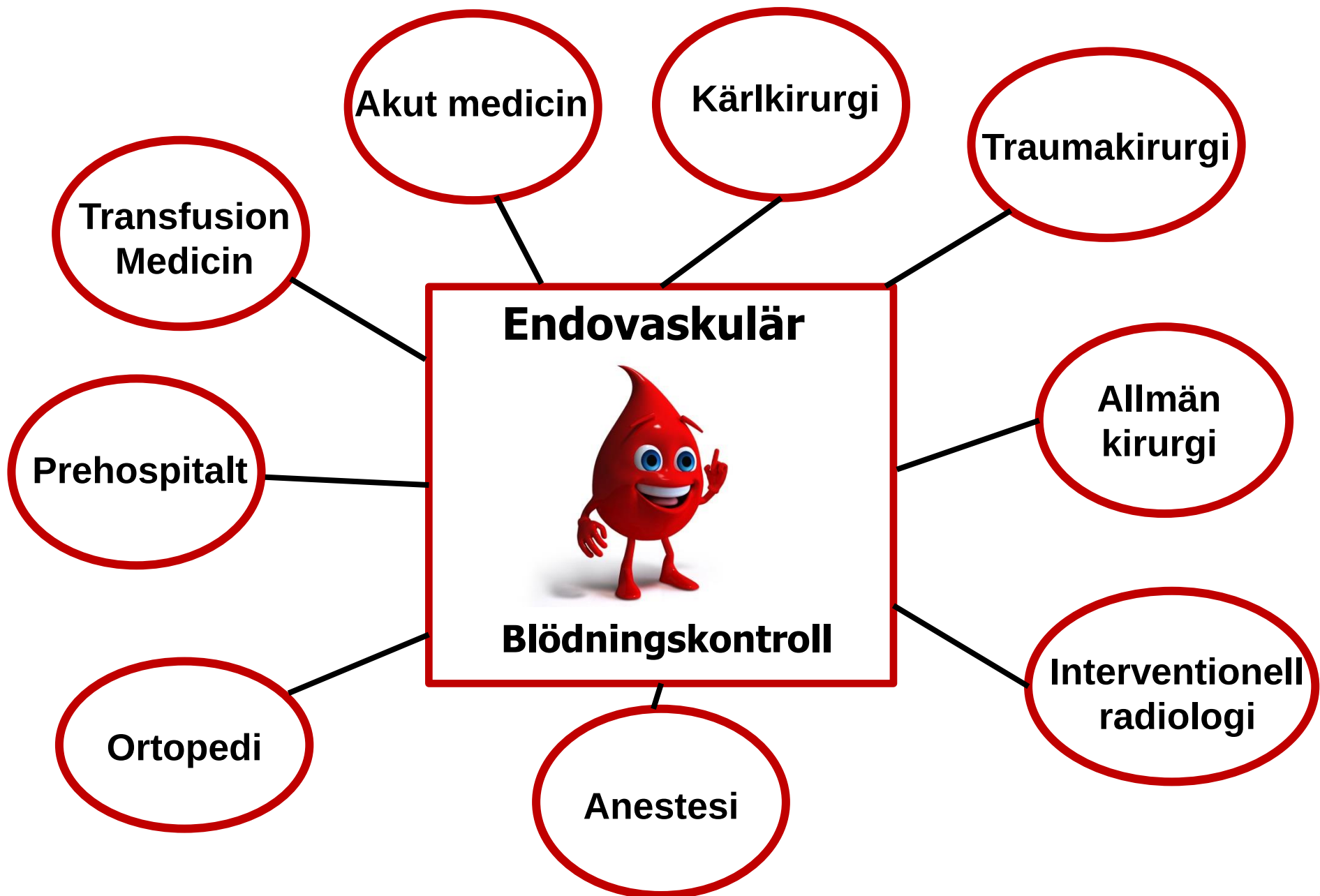
Trauma Surgery 2

Haemorrhage control in severely injured patients

Russell L Gruen, Karim Brohi, Martin Schreiber, Zsolt J Balogh, Veronica Pitt, Mayur Narayan, Ronald V Maier

Lancet 2012; 380: 1099–108

**Endovaskulära tekniker används alltmer som verktyg
för blödningskontroll**



Endovaskulära tekniker

Endovaskulär behandling kan övervägas hos patienter med

(1) multipla co-morbiditeter

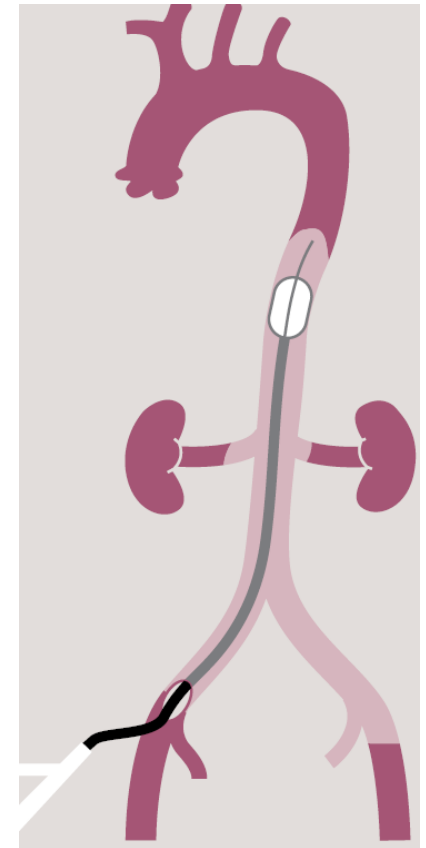
(2) flertalet svåra skador

(3) distal arteriella skador som är svåra att nå kirurgiskt

Teixeira/DuBose Surg Clin N Am 97 (2017)

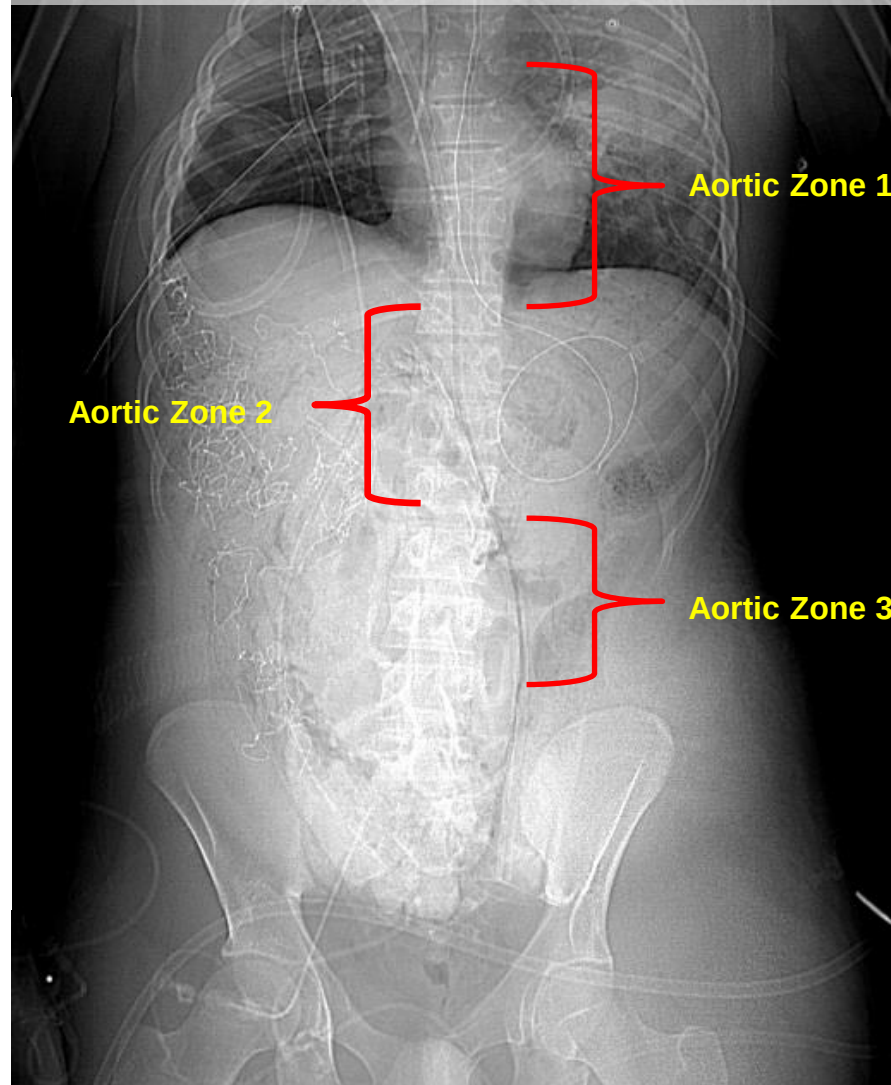
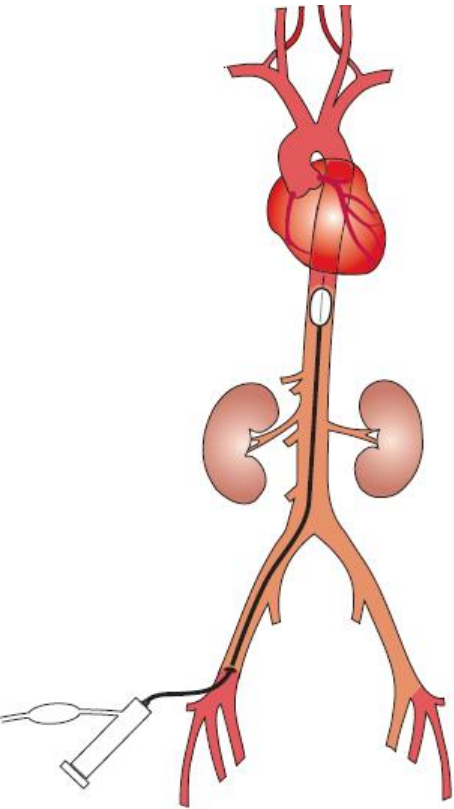
Endovaskulära Tekniker

- ☐ REBOA
- ☐ Ballongocklusion
- ☐ Angioembolisering
- ☐ Stentgrafter
- ☐ Arterial closure device



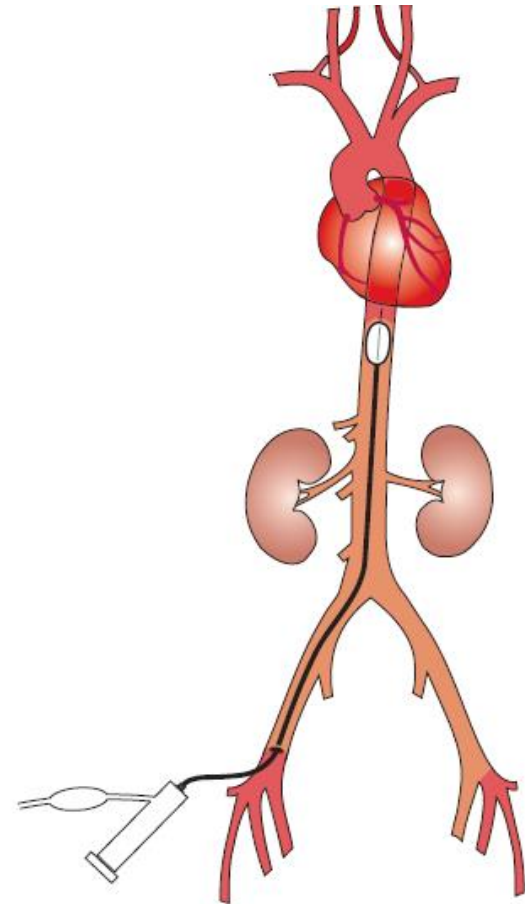
REBOA

Resuscitative Endovascular Balloon Occlusion of the Aorta



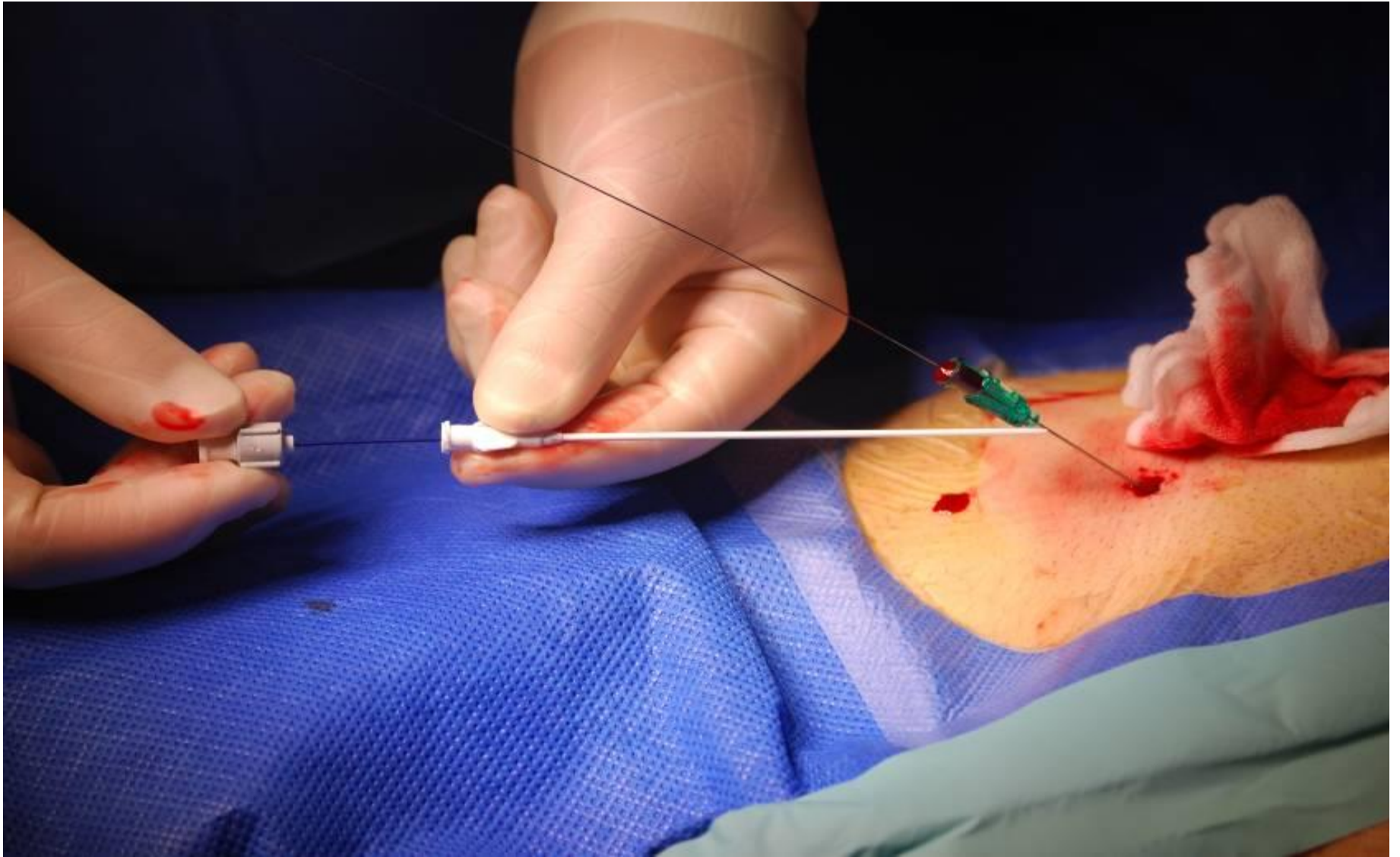
Stannard et al 2011

1. Arteriell access
2. Ballong position
3. Ballong uppblåsning
4. Ballong nedtagning
5. Borttagande introducer



Martinelli (2010), Tsurukiri (2016), DuBose (2016)





Arteriell Access

.....kan vara utmanande.....

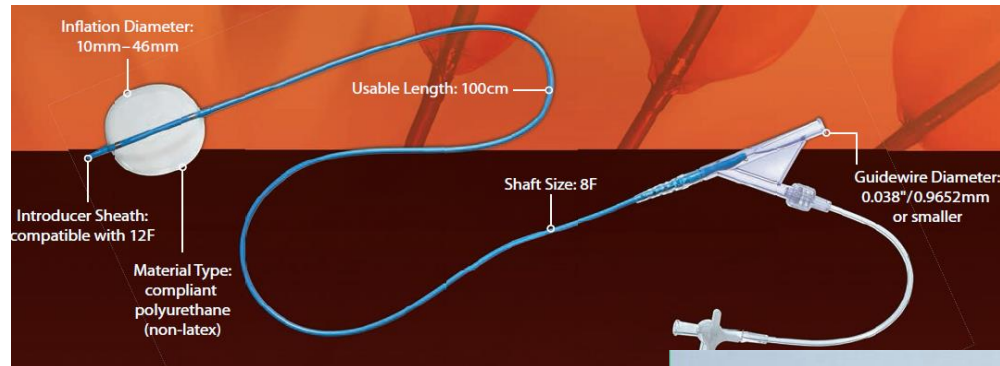
- uttalad chock
- äldre
- obesitas
- hjärtstopp

Perkins et al 2016



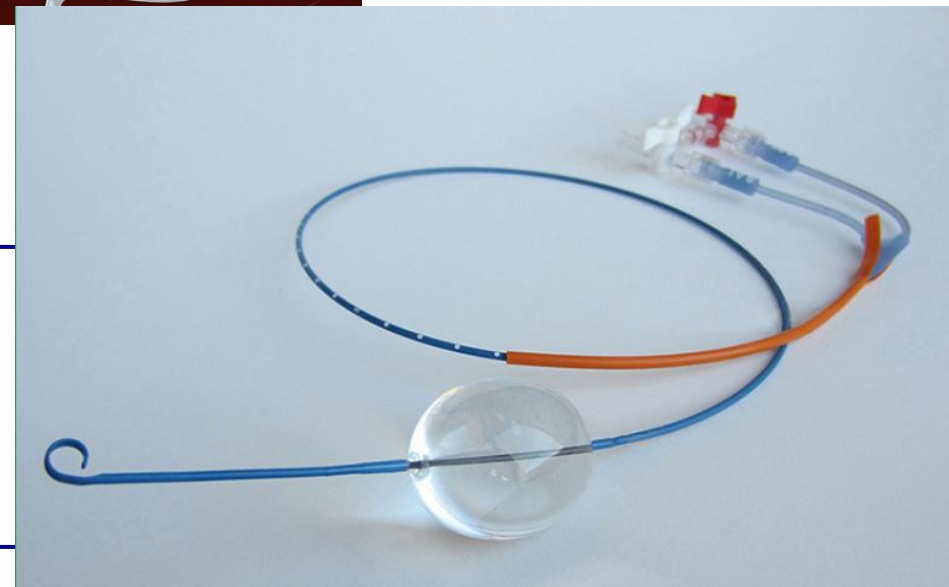
Tidskrävande; kan försena blödningskontroll

Teknisk utveckling



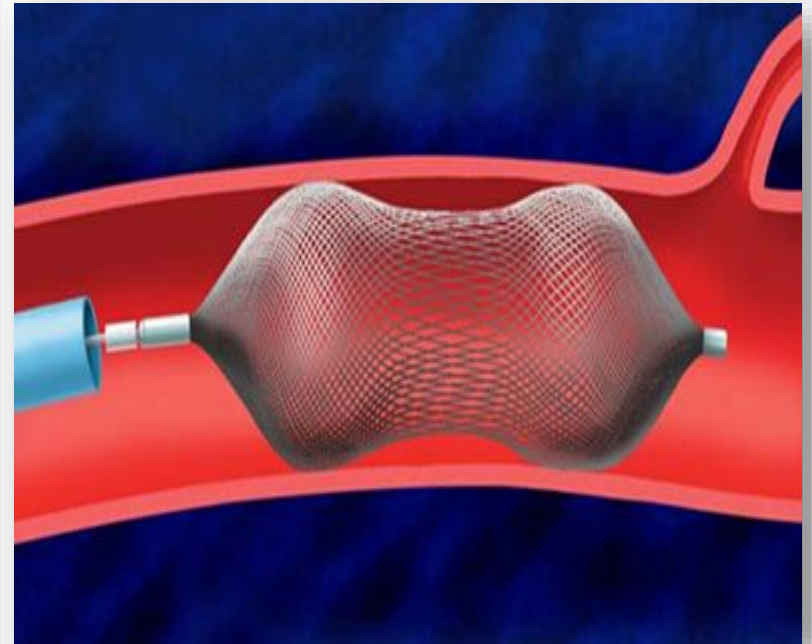
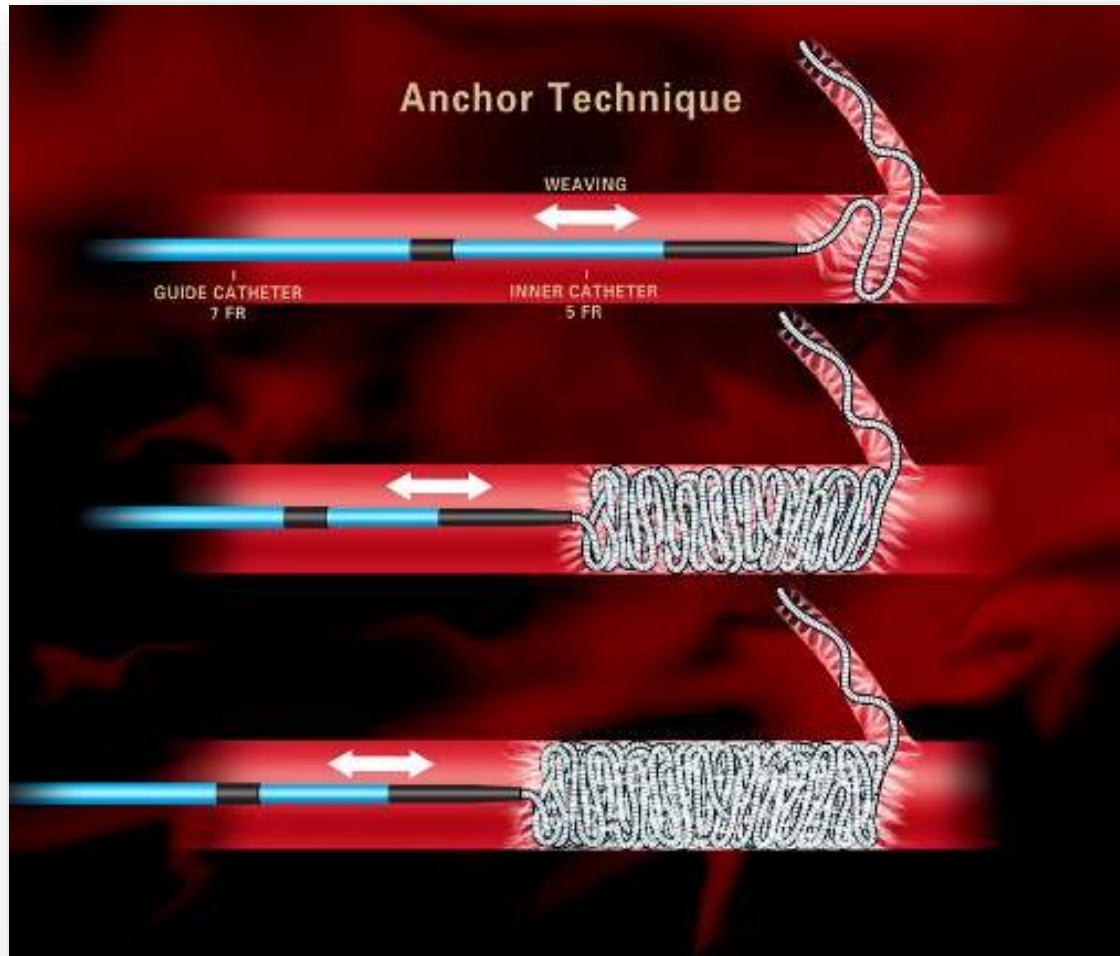
7Fr. Sheath Compatible IABO Catheter

RESCUE BALLOON
Intra-Aortic Balloon Occlusion Catheter





Anchor Technique

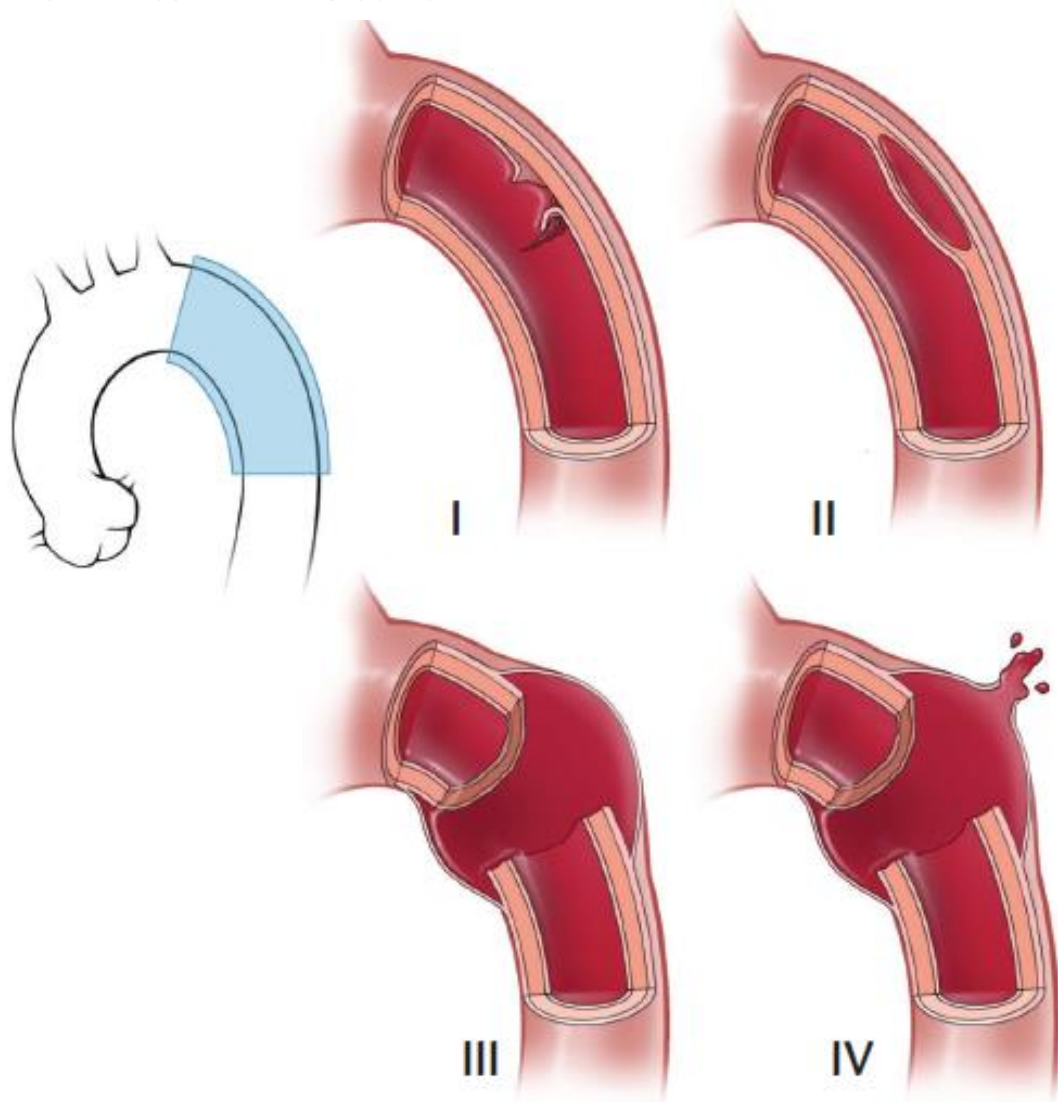


Traumatisk aortaskada (TAI)



Editor's Choice — Management of Descending Thoracic Aorta Diseases

Clinical Practice Guidelines of the European Society for Vascular Surgery (ESVS)

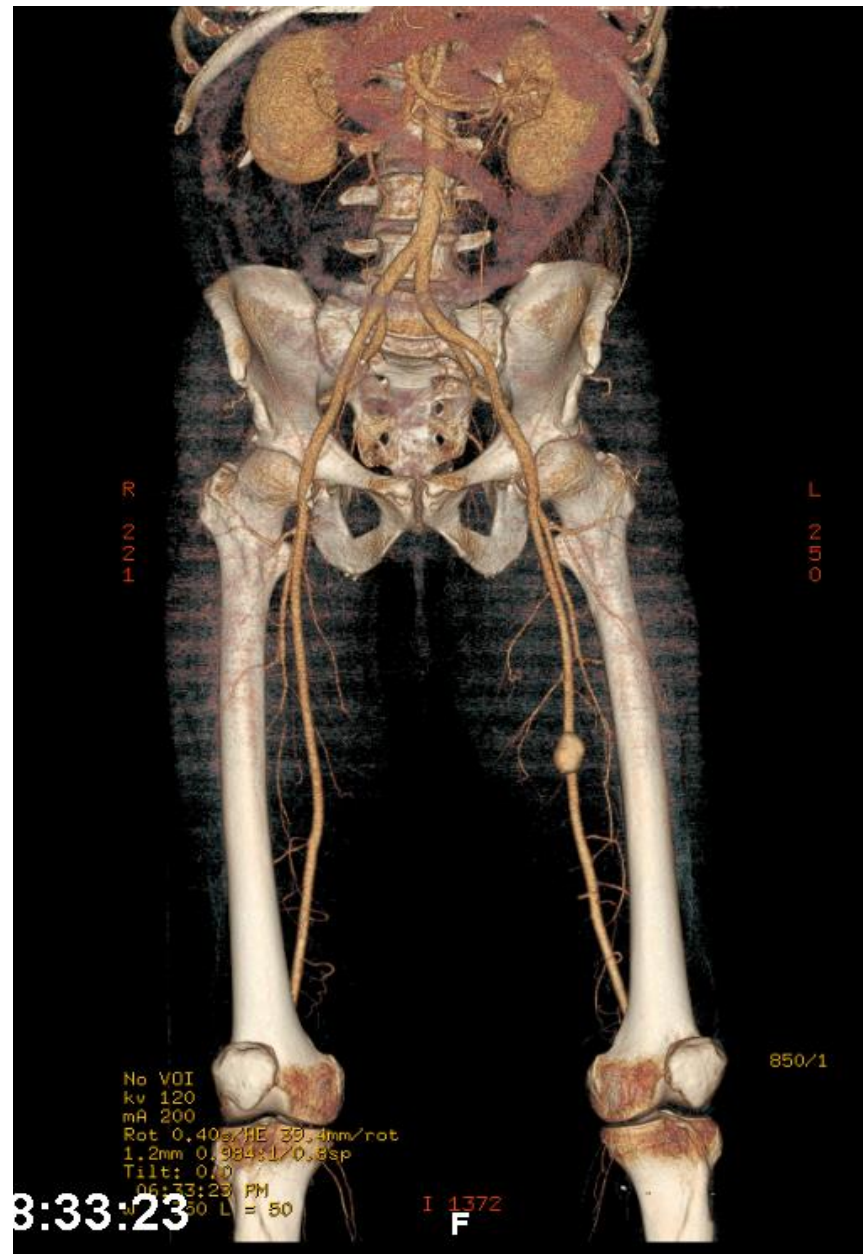


Thorakal Endovaskulär Aorta Rekonstruktion (TEVAR)

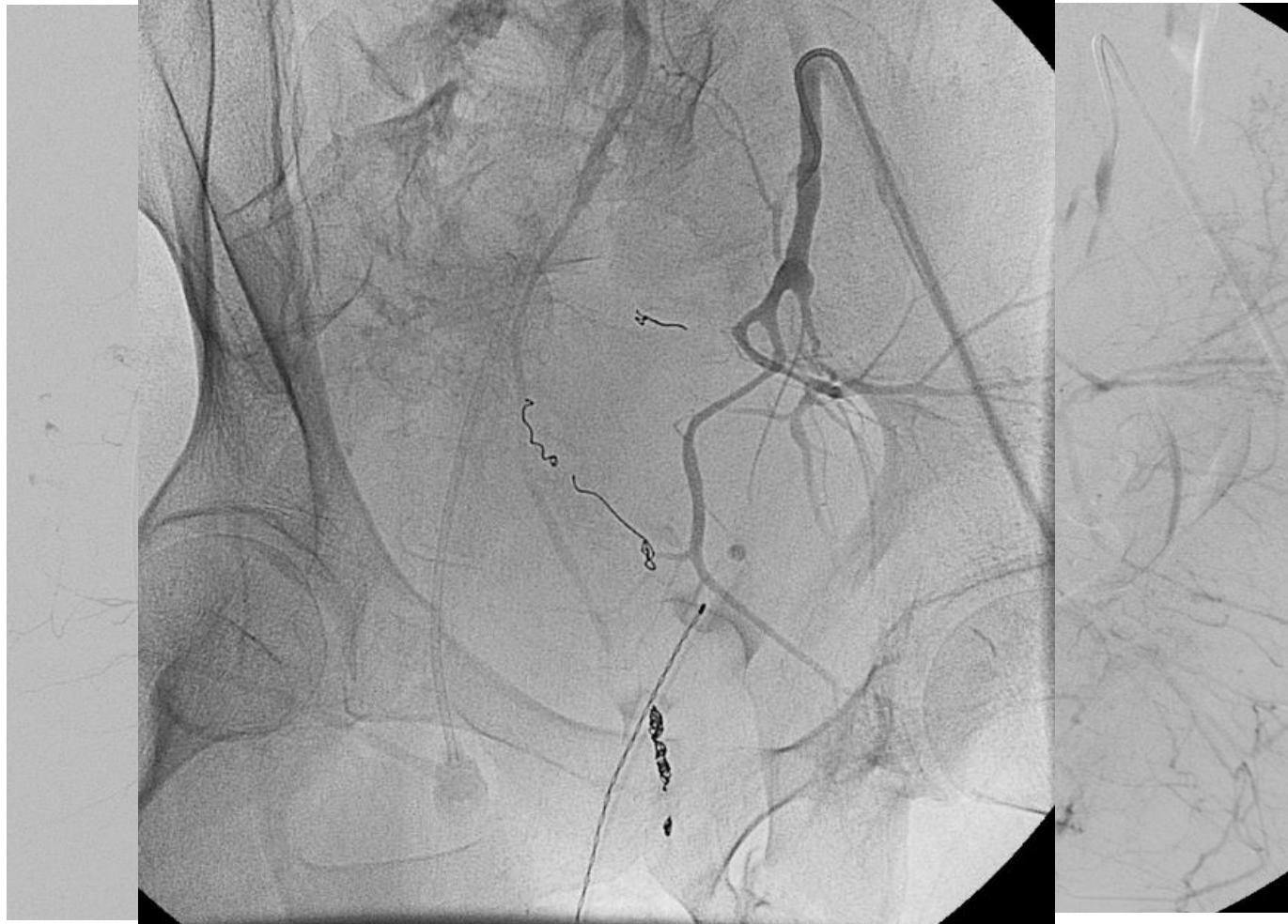




Stengraft Knivskada lår



Embolisering Bäcktblödnig



Stoppa blödningen!

- Stoppa blödningen
- Tiden är viktig
- Endovaskulära tekniker kan användas vid olika blödningstillstånd:
 - *Traumatisk blödning*
 - *Rupturerat bukaortaaneurysm*
 - *Post partum blödning*
 - *Gastrointestinal blödning*
- Optimering koagulation/transfusion



