

Viscerale aneurismer

DFIR 7. oktober 2021

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Overlæge Radiologisk afdeling RH

Inndeling

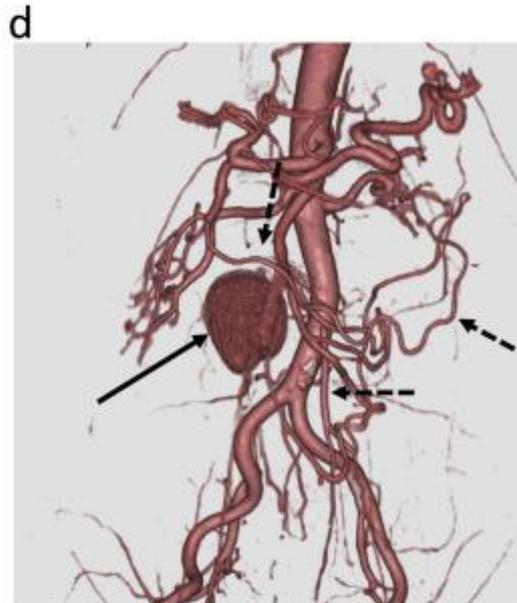
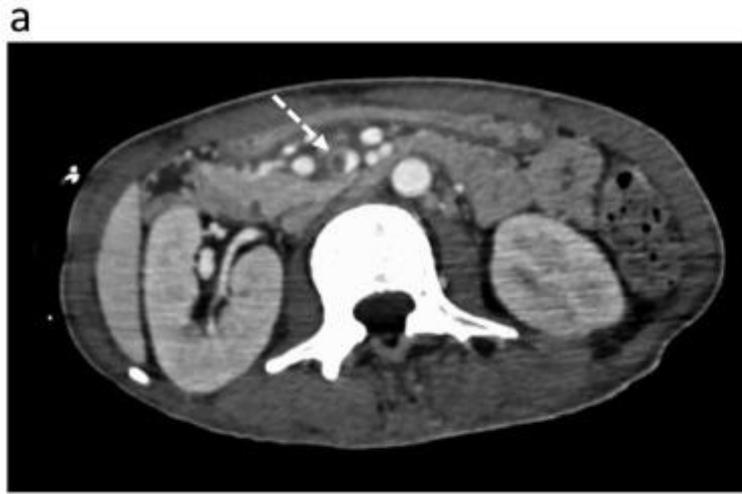
- Sande aneurismer
 - Pseudoaneurismer
 - Viscerale aneurismer
 - Renale aneurismer
 - Mykotisk aneurisme
 - Graviditet
- HAA, SAA, RAA, SMAA...
 - HAPA, SAPA, RAPA...
 - VAA }
• RAA } VRAA

En sjælden sygdom

- Incidens VRAA 0,1-2%
- Omkring 5% af AA er VAA
- Ruptur ved debut
 - Sande: 20%
 - Falske: 70%
- RAA 0,1%
 - Sektion 0,01-0,09%
 - A-grafi 0,73-0,97%

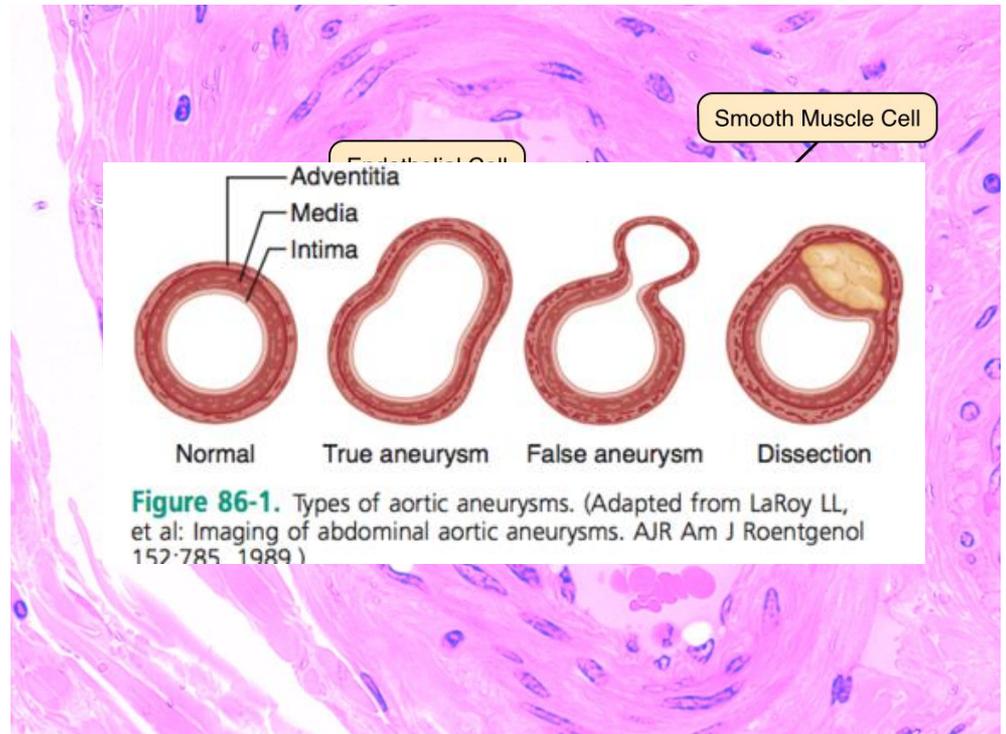
Hvad siger guidelines?

- Rumperede aneurismer skal behandles med det samme
- Aneurismer hos gravide skal behandles uanset størrelse
- Mykotiske aneurismer skal behandles uanset størrelse



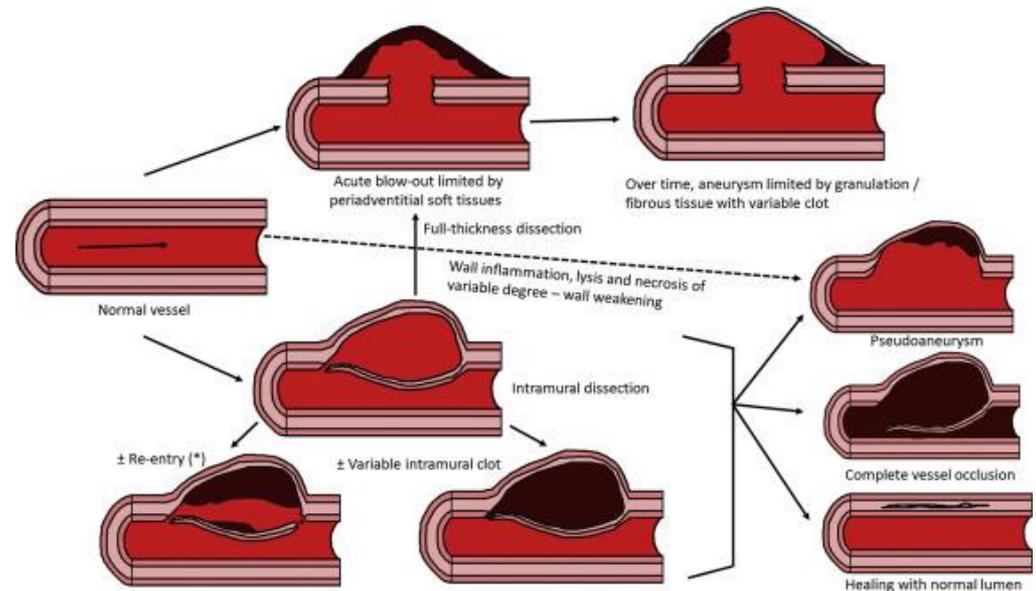
Pseudoaneurismer

- Mangler større eller mindre del af karvæggen
- Uforudsigelig vækstmønster
- Kan pludselig rumpere
- Behandles uanset størrelse
- Bør ikke ”pakkes med coils”



Naturhistorie

- Traume/karskade
 - Stumpt/skarpt
 - Iatrogen
 - Knive
 - Nåle
- Infektion
 - Pancreatitis
 - Endocarditis



Post operativt PA pancreaticoduodenale arkade



Postoperativ PA

Embolisering under aktiv blødning



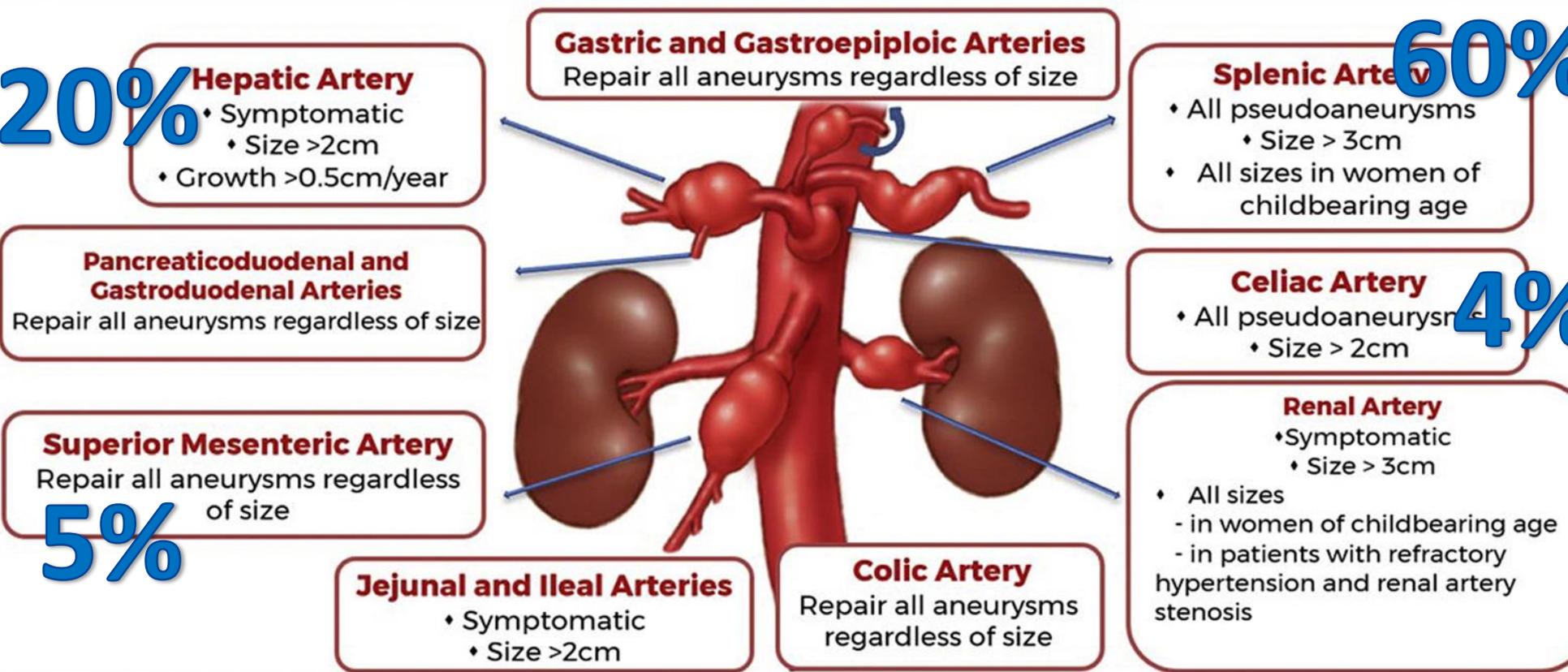
Sande aneurismer

- Degenerative/atherosklerotiske
 - Tab glatte muskelceller, brud på elastiske fibre
- Fibromuskulær dysplasi
- Arvelige
 - Marfan-, Ehlers-Danlos syndrom
- Aortaaneurismer
 - Diastolisk BT > 100 mmHg
 - Rygning => øget protease aktivitet hos nogen

SVS guidelines 2020

80 studier - 2845 aneurismer

SVS Clinical Practice Guidelines on the Management of Visceral Aneurysms



Miltarterieaneurismer

SVS 2020 - 775 SAA

2. Treatment indications, size criteria, and true vs false aneurysms

Recommended criteria for invasive intervention for SAA

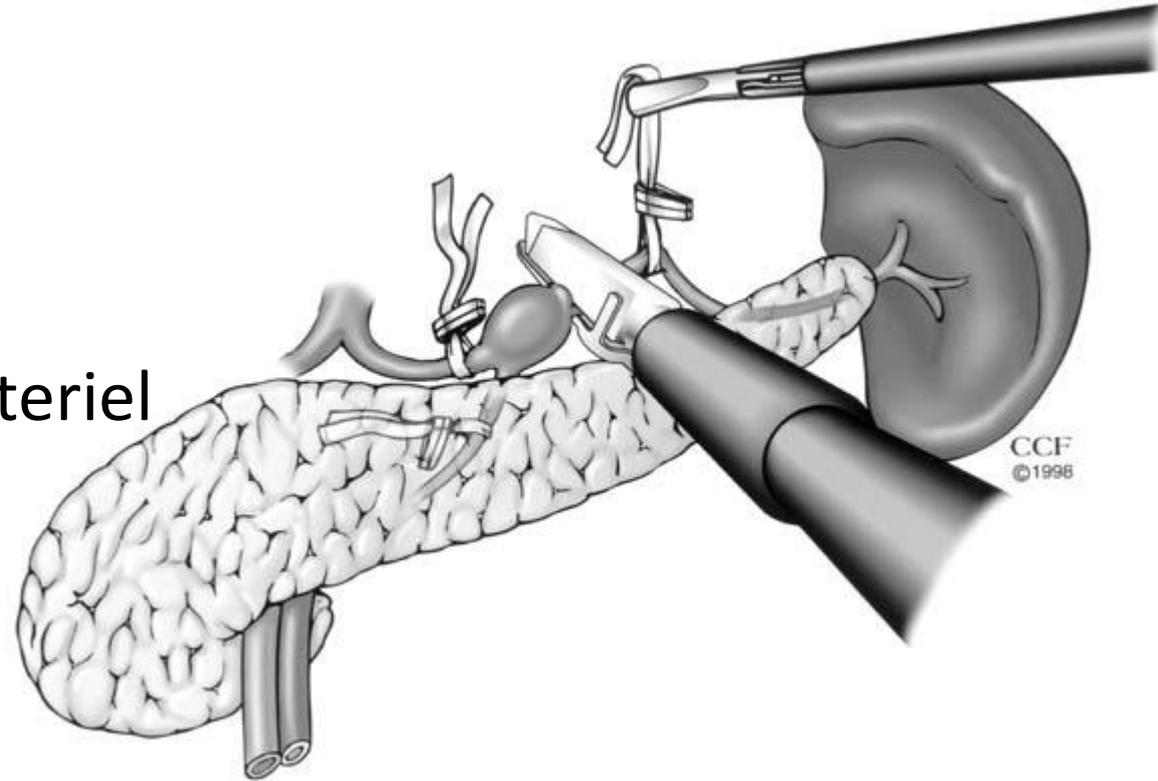
	Recommendation	Strength of recommendation	Quality of evidence
2.1	We recommend emergent intervention for ruptured SAAs.	1 (Strong)	A (High)
2.2	We recommend treatment of nonruptured splenic artery pseudoaneurysms of any size in patients of acceptable risk because of the possibility of rupture.	1 (Strong)	B (Moderate)
2.3	We recommend treating nonruptured splenic artery true aneurysms of any size in women of childbearing age because of the risk of rupture.	1 (Strong)	B (Moderate)
2.4	We recommend treating nonruptured splenic artery true aneurysms ≥ 3 cm, with a demonstrable increase in size, or with associated symptoms in patients of acceptable risk because of the risk of rupture.	1 (Strong)	C (Low)
2.5	We suggest observation over repair for small (< 3 cm), stable asymptomatic splenic artery true aneurysms or those in patients with significant medical comorbidities or limited life expectancies.	2 (Weak)	C (Low)

SAA

- Tilvækst
 - Langsom vækst 0,2-0,6 mm/år
 - Et fåtal vokser
- Rupturrisiko (n 233)
 - SAA 3,1%
 - SAPA 76,3%
- Mortalitet
 - SAA 25%
 - SAPA 50%
 - Graviditet 80% m / 90% f
- Behandling hvis
 - $\emptyset > 3$ cm
 - Vækst > 5 mm/y
 - Graviditet
 - Portal hypertenseion
- Mayo Clinic 217 patienter, 50% fulgt med serielle skanninger i 75 mdr. \emptyset 2,1 cm mean, kun 10% vokser, 0,6 mm/år, ingen ruptur eller komplikationer
- Cleveland Clinic 66 patienter, 94% med serielle skanninger gennem 3,1 år, \emptyset 1,7 cm mean, tilvækst 0,2 mm/år, ingen ruptur eller komplikationer

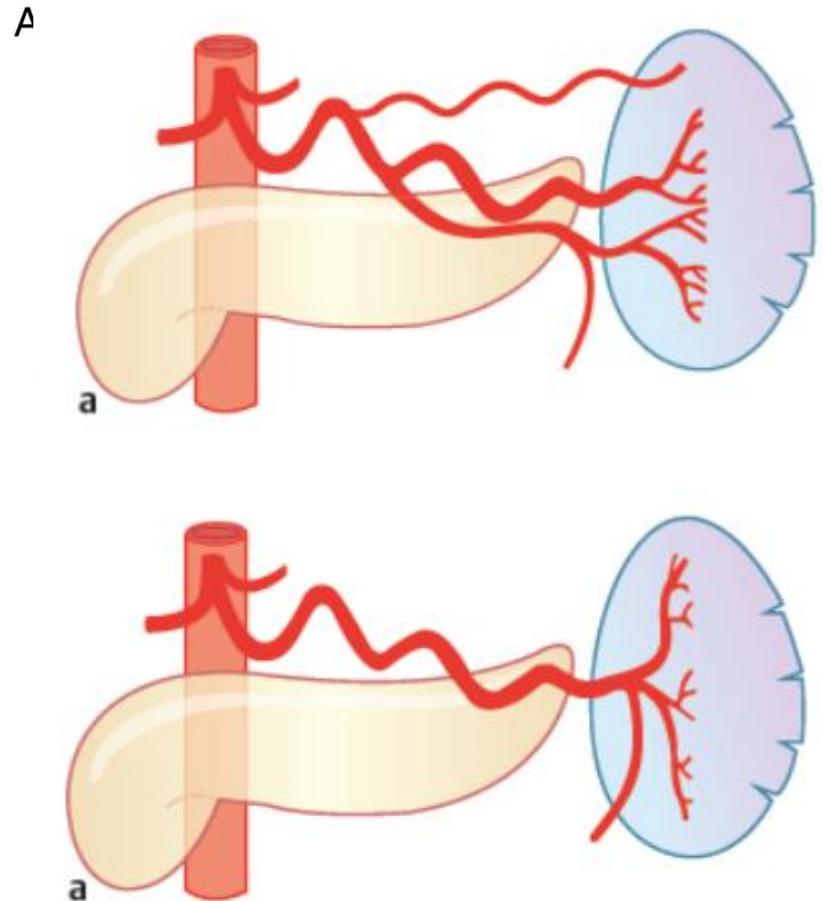
Behandling af SAA

- Splenektomi
- Ligering
- Aneurismektomi
- Transaneurismal arteriel ligering
- Laparoskopisk
- Endovaskulær



EV - Tekniske overvejelser

- Lokalisation
 - 5% centralt
 - 20% midt
 - 75% perifert
- Anatomi
 - Kollateral forsyning
 - Proptrækker?
- Embolisering
 - Bække sider
- Stentgraft
 - Hvis anatomi tillader



EV-Resultater SAA

Teknisk succes 97% - klinisk succes 98%

- Miltinfarkt
 - Hilært aneurisme (n 6 af 20)
 - Inkomplet kollateral forsyning
 - Nontarget embolisering
- Miltatrofi (2 af 20)
- Pancreatitis
- Post embolisering syndrom
- Rekanalisering (18% - 30%, 1996 og 1998)

Elektivt SAA – 2,5 cm



Leverarterieaneurismer

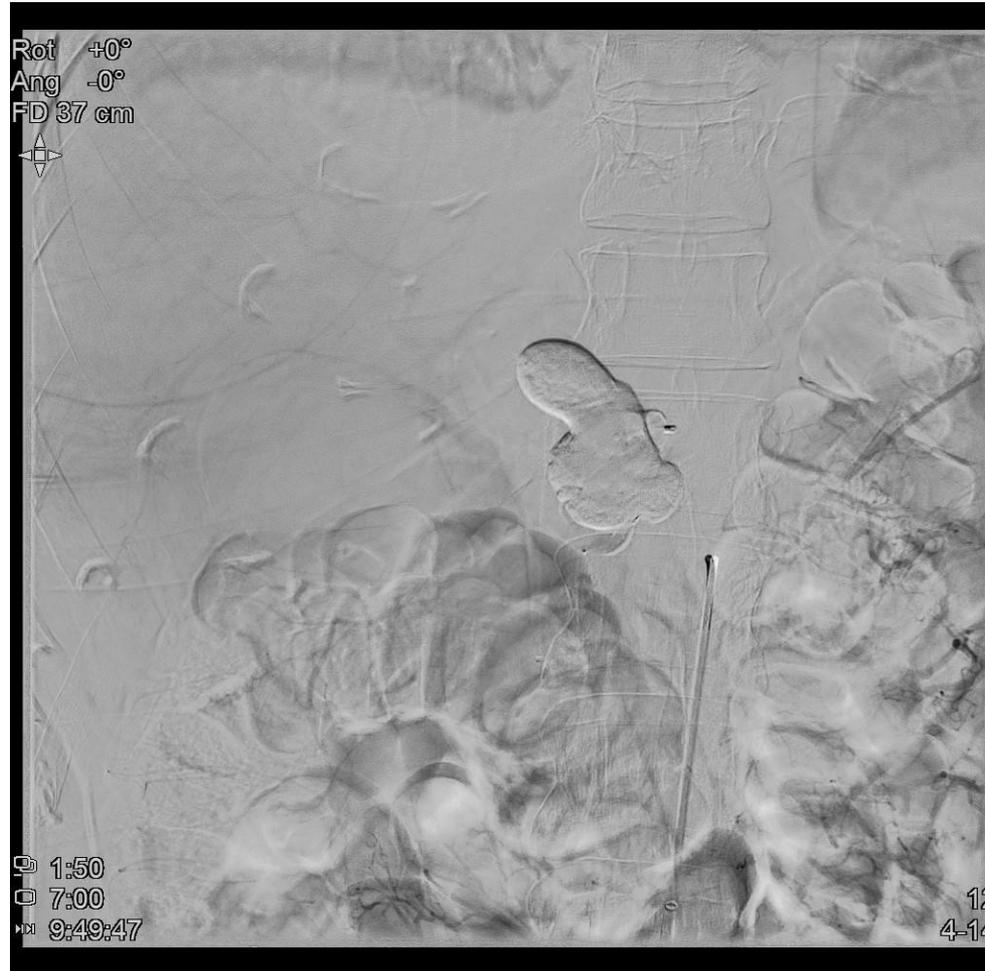
SVS 2020 - 359 HAA

- Tilvækst
 - Op til 8 mm/år
 - 27% af 22 fulgt i 68 måneder vokser
- Rupturrisiko
 - 14-80%?
 - 50 % subgruppe med fibromuskulær dysplasi eller polyarteritis nodosa
- Mortalitet
 - 30%
- Behandlingsgrænse
 - Højrisiko pt $\emptyset > 5$ cm (åben)
 - Lavrisiko pt $\emptyset > 2$ cm (EV)
- 0,002% af 2 mio (Mayo Clinic)
- HAA associeret med
 - SLE, fibromuskulær dysplasi, polyarteritis nodosa, Takayasu arteritis, Wegener granulomatose
- Medfødte årsager til HAA
 - Marfan syndrom, Ehlers-Danlos syndrom Osler-Weber-Rendu syndrom
- 77% ekstrahepatisk
- 20%intra- og ekstrahepatisk
- 3% intrahepatisk

Komplikationer

- Infarkt
- Galdegangsisiskæmi
- Galdeblærenekrose
- Abscessdannelse
- Rekanalisering
- Postembolisering syndrom 25%

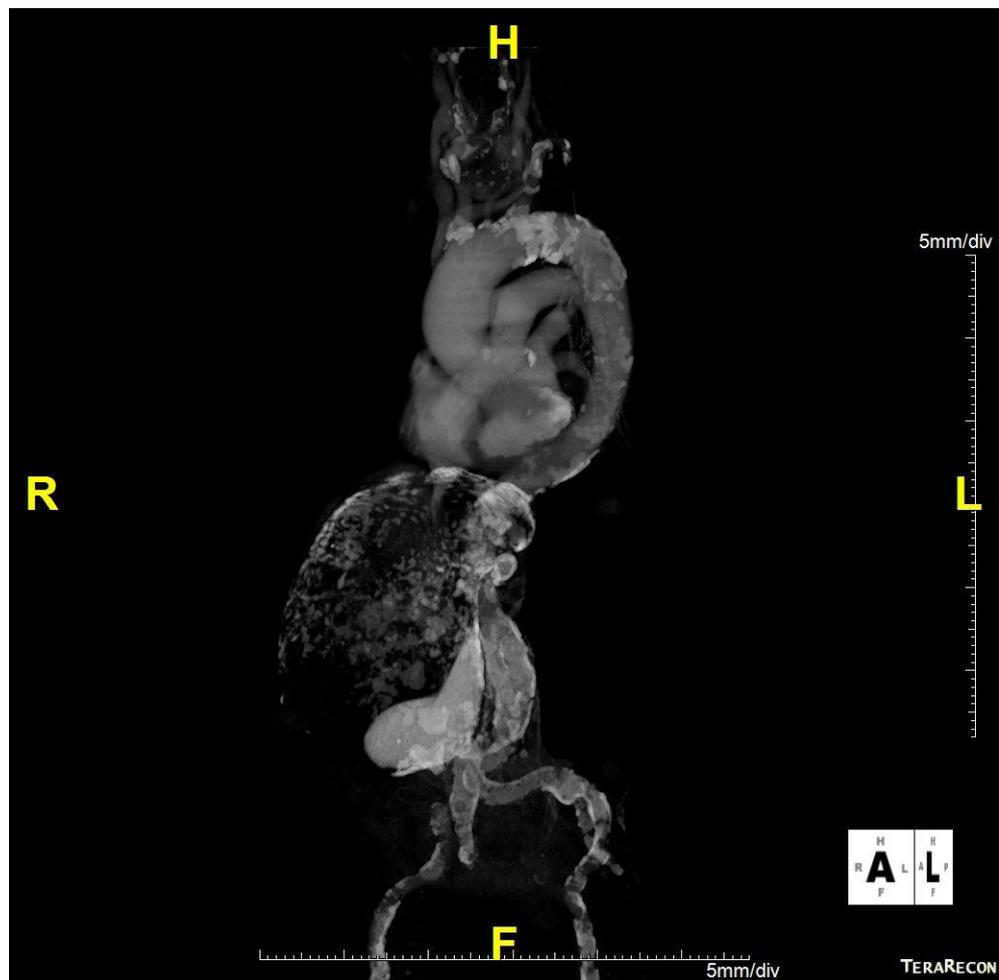
HAA 4 cm - profylaktisk



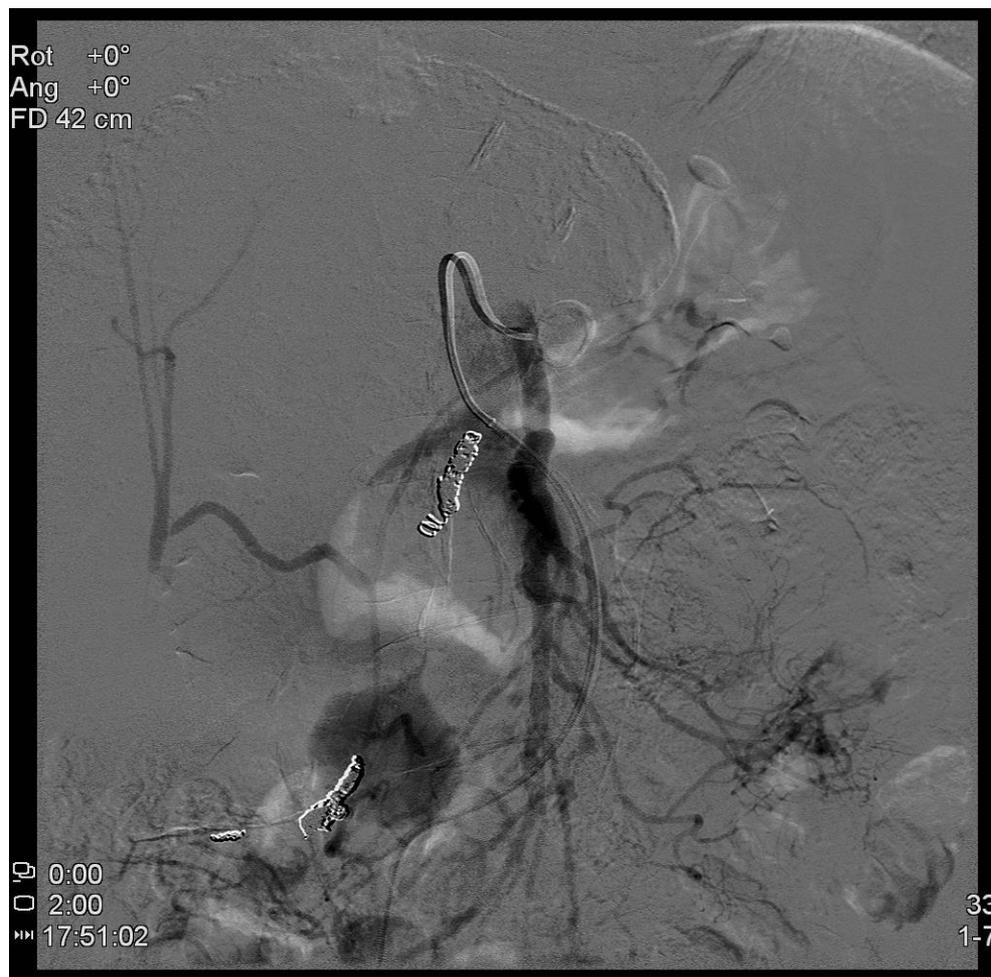
Gigantisk HAA – post hæmoragi



Gigantisk HAA



Gigantisk HAA



Hvornår skal RAA behandles?

1297 aneurismer

2. Size criteria and alternative indications for intervention

Recommendations for indications for intervention in RAA			
	Recommendation	Strength of recommendation	Quality of evidence
2.1	In patients with noncomplicated RAA of acceptable operative risk, we suggest treatment for aneurysm size >3 cm.	2 (Weak)	C (Low)
2.2	We recommend emergent intervention for any size RAA resulting in patient symptoms or rupture.	1 (Strong)	B (Moderate)
2.3	In patients of childbearing potential with noncomplicated RAA of acceptable operative risk, we suggest treatment regardless of size.	2 (Weak)	B (Moderate)
2.4	In patients with medically refractory hypertension and functionally important renal artery stenosis, we suggest treatment regardless of size.	2 (Weak)	C (Low)

Ændring i behandlingsgrænse hos asymptomatiske RAA

Tidligere

- Tilvækst
 - 16 mm/år
- Rupturrisiko
 - 14-30%
- Mortalitet
 - 80%
- Behandlingsgrænse
 - 2 cm

Aktuelt

- Tilvækst
 - 0,06-0,6 mm/år
- Rupturrisiko
 - 3-5%
- Mortalitet
 - 10% < VAA
- Behandlingsgrænse
 - 3 cm

The contemporary management of renal artery aneurysms

Jill Q. Klausner, BS,^a Peter F. Lawrence, MD,^a Michael P. Harlander-Locke, MPH,^a
 Dawn M. Coleman, MD,^b James C. Stanley, MD,^b and Naoki Fujimura, MD,^c for the Vascular
 Low-Frequency Disease Consortium, *Los Angeles and Stanford, Calif; and Ann Arbor, Mich*

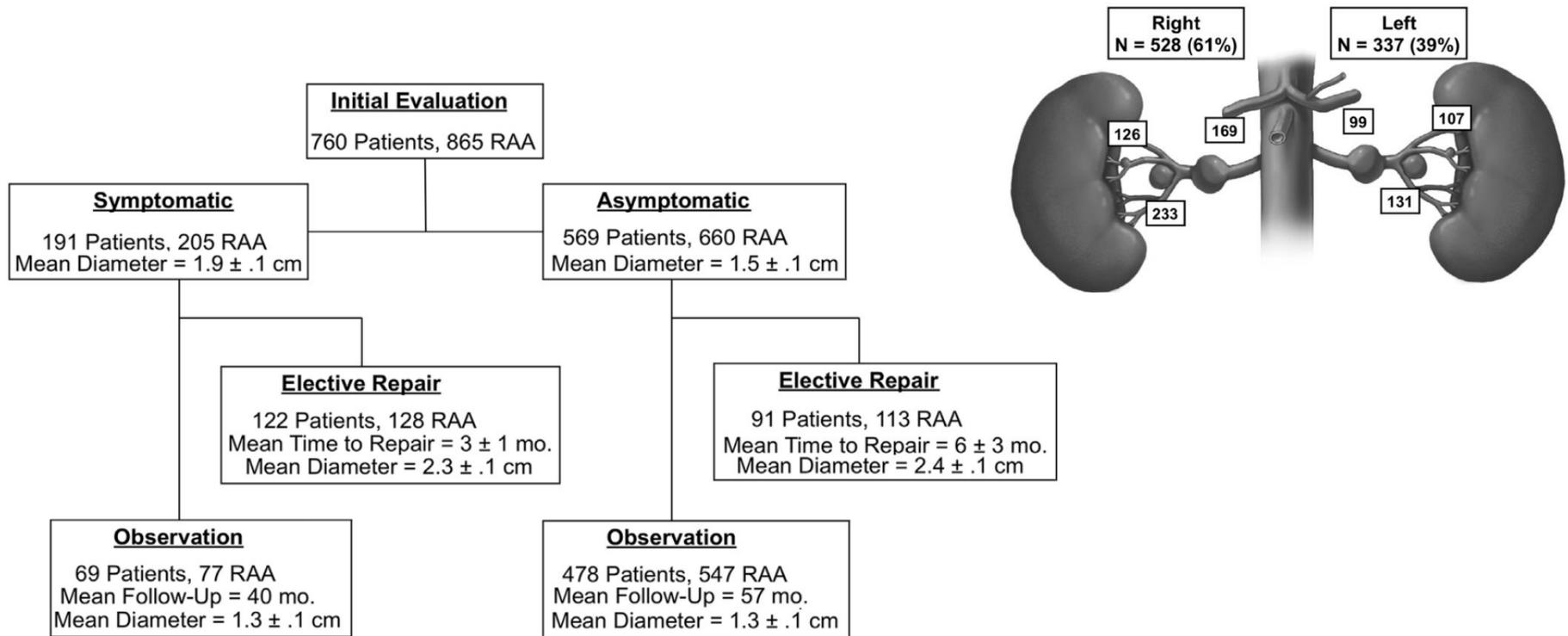


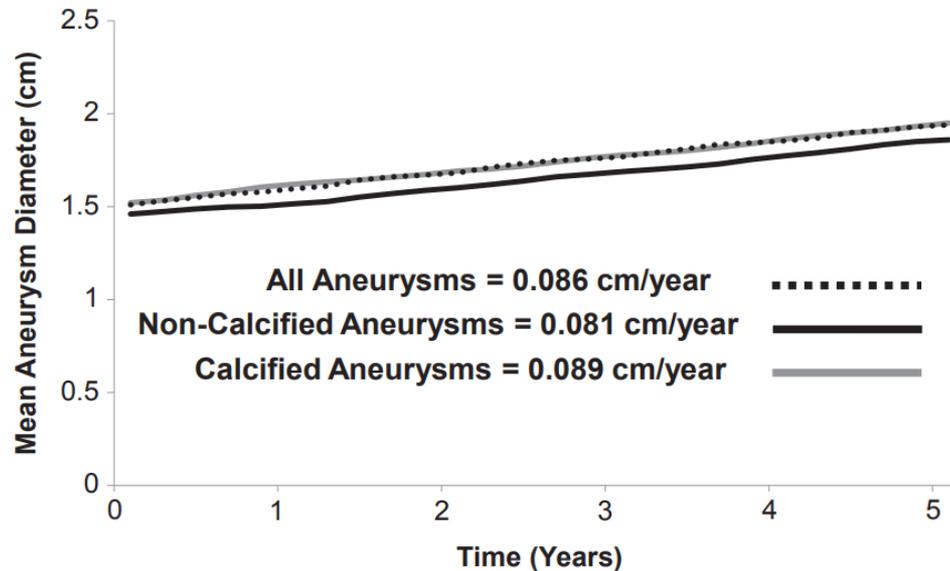
Fig 2. Management used for patients with renal artery aneurysms (RAAs).

Debutsymptomer

Table II. Presenting symptoms

<i>Symptoms</i>	<i>Patients (N = 760), No. (%)</i>
Asymptomatic	569 (75)
Difficult-to-control hypertension	76 (10)
Flank pain	46 (6)
Hematuria	30 (4)
Abdominal pain	15 (2)
Other (back pain, etc)	24 (3)

Vækstrate hos asymptomatiske

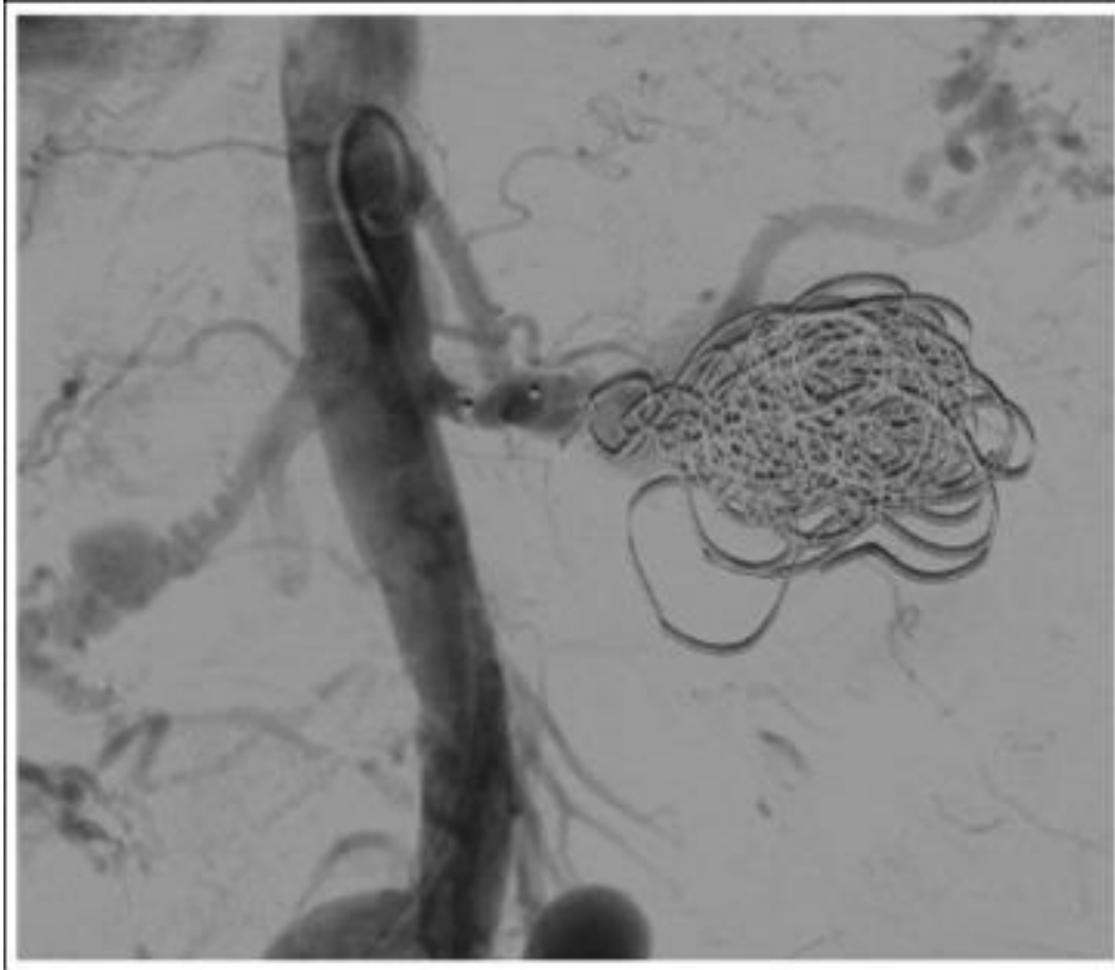


- 454 aneurismer FU samme modalitet
- 293 aneurismer uden tilvækst
- Aneurismer subgruppe > 2 cm
 - Vækst 0,2 cm/y – ikke signifikant forskellig

Ruptur

- Ingen ruptur i opfølgingsgruppen
- 3 patienter debuterede med ruptur
- Rupturraten
 - Totalt 0,3% (3/865 RAA)
 - $\emptyset > 3$ cm 18% (3/17 RAA)

Hvordan behandle RAA?

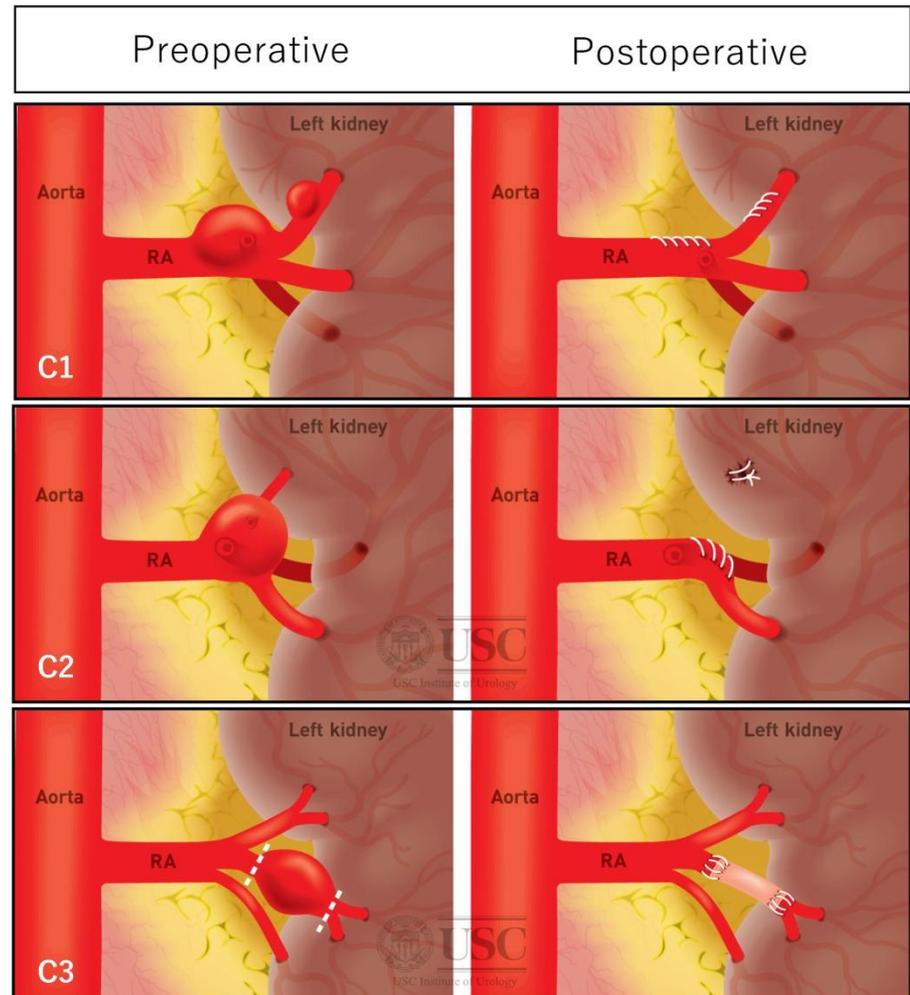


Medicinsk behandling

- Antihypertensiva
 - Kirurgisk behandling til RAA < 3 cm kan overvejes hvis blodtryksskontrol er vanskelig
- Pladehæmmer behandling
- Statin behandling

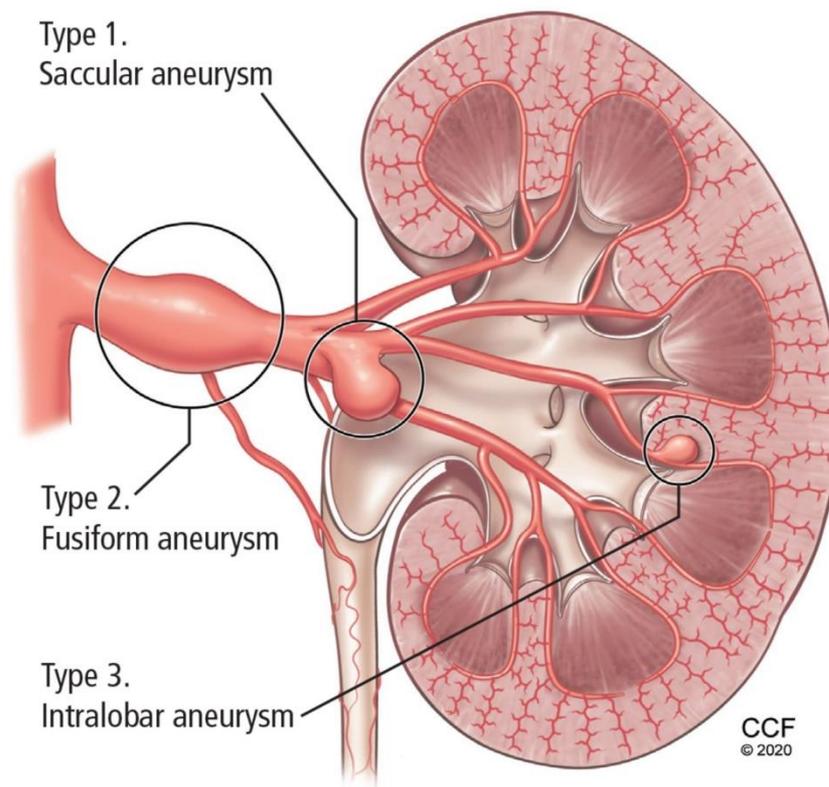
Kirurgisk behandling

- Aneurismektomi
- Arterioraphi
- Ex vivo repair
 - Cold perfusion
- Nefrektomi
- Robotassisteret laparoskopisk repair



Endovaskulær behandling

- Afhængig af lokalisation
 - Hovedgren
 - Binyre, urethra
 - Hilus
 - Delingssted
 - Parenchym
 - Endearterier
- Afhængig af formen
 - Sacculat
 - Fusiformt



Tom Kai Ming Wang, and Milind Y. Desai CCJM
2020;87:755-758

Tilfældigt fundet RAA



Truncus coeliacus aneurismer

SVS 2020 - 87 CAA

- **Tilvækst**

- 1 ruptur blandt 8 asymptomatiske CAA fulgt i 91 mdr, ingen vækst af nonrumperede

- **Rupturrisiko**

- Samlet 10-20%
- \emptyset 15-22 mm 5%
- $\emptyset > 32$ 50-70%

- **Mortalitet**

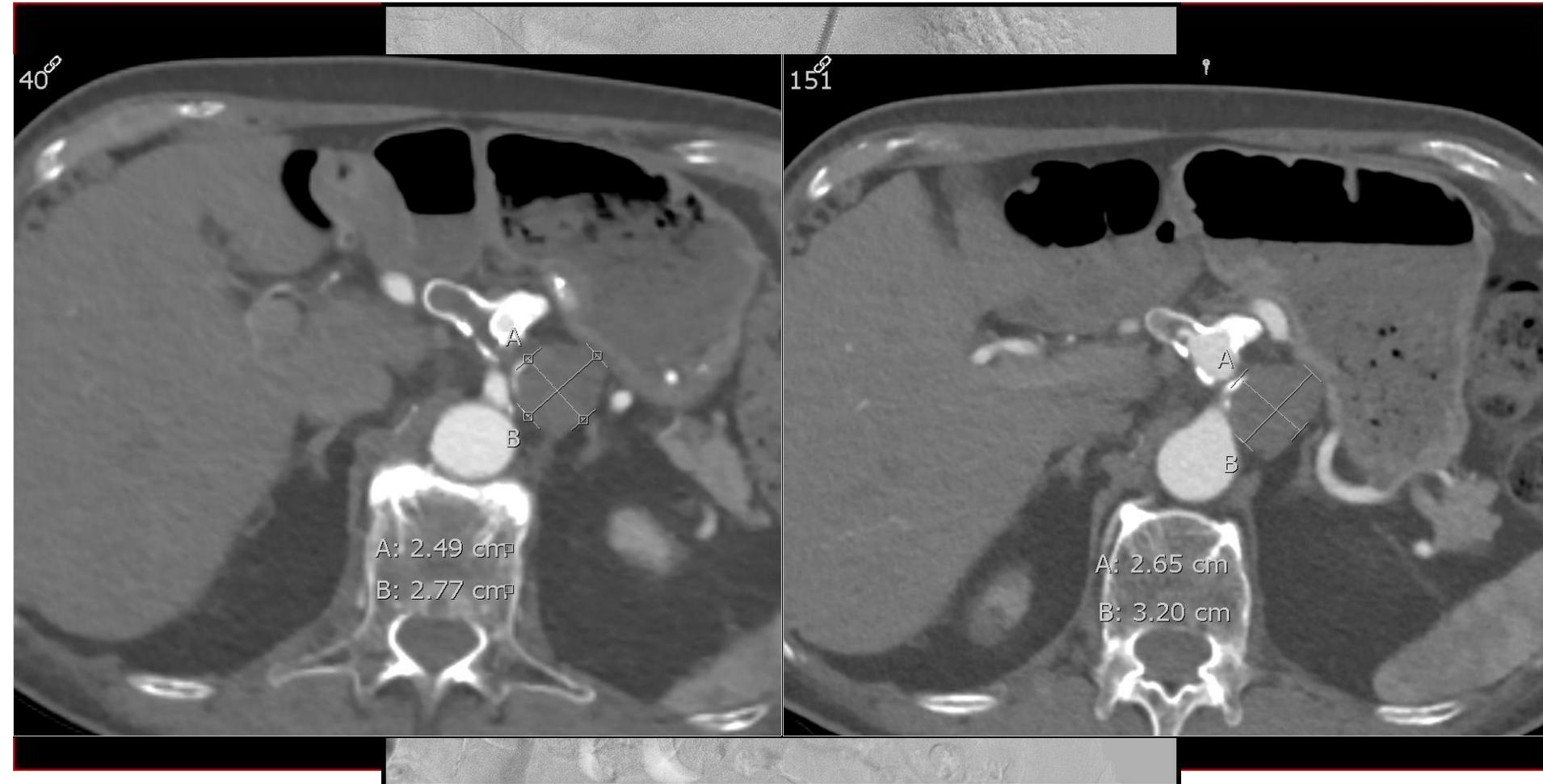
- Næsten 100% (33 af 34, 1943)

- **Behandlingsgrænse**

- CAA $\emptyset > 2$ cm (asymptomatiske)

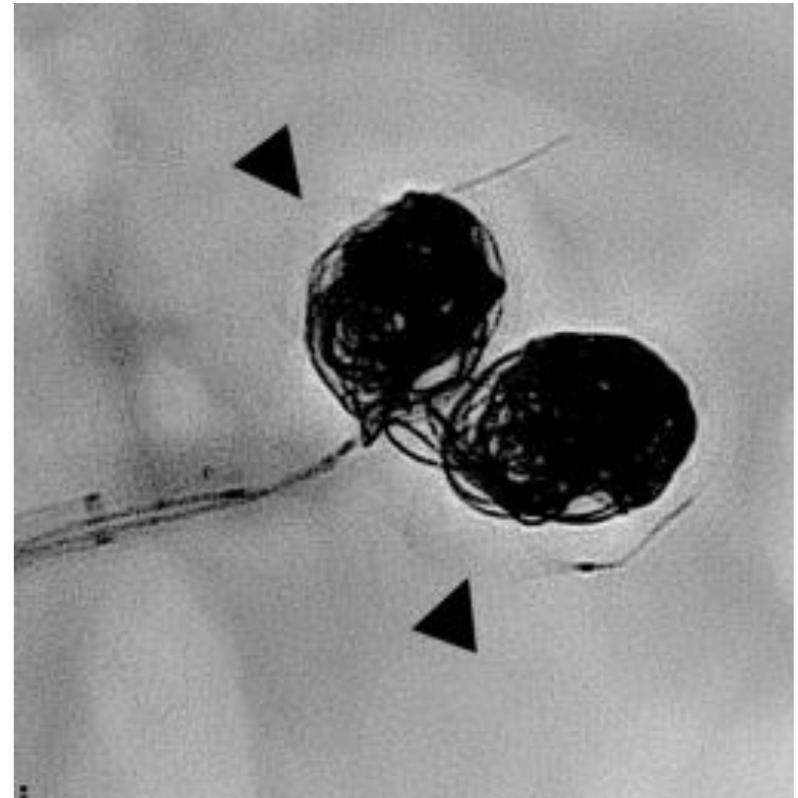
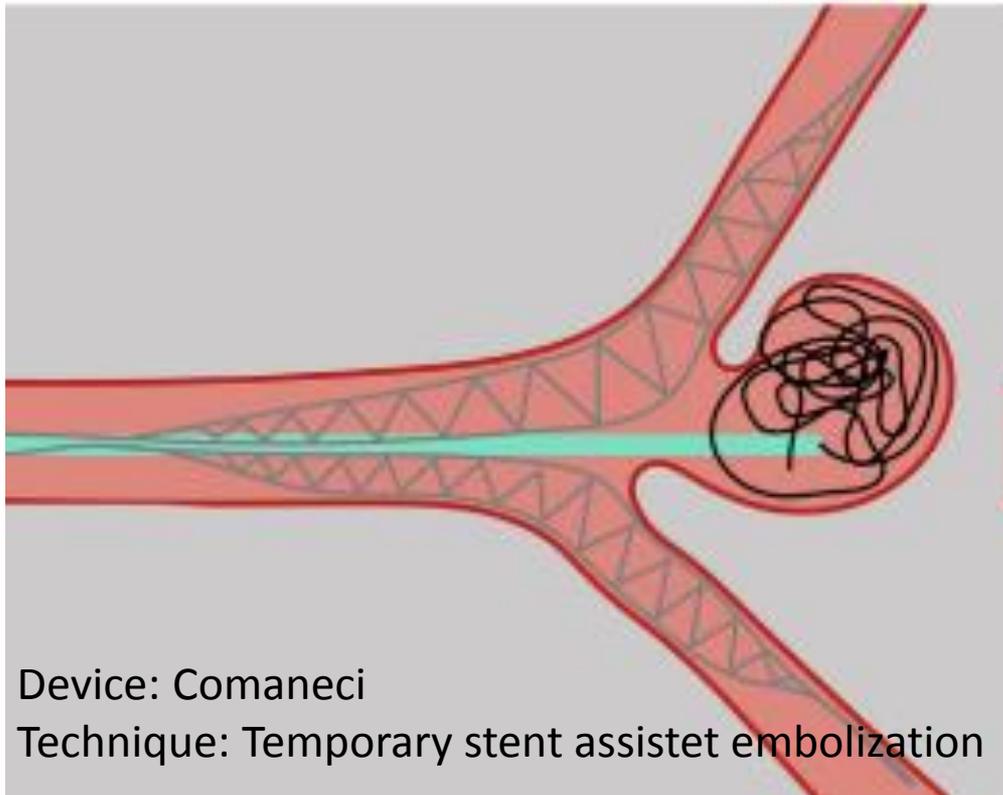
- Spontan dissektion transformeres sjældent til aneurisme i viscerale arterier – ingen rekommendation
- Poststenotisk dilatation pga MALS behandles konservativt hvis asymptomatisk
- CAPA oftere symptomatiske
 - 80% af 28 CAPA
 - 20% af 20 CAA
- Højere 30d-mort v symp

Thromboseret TC aneurisme



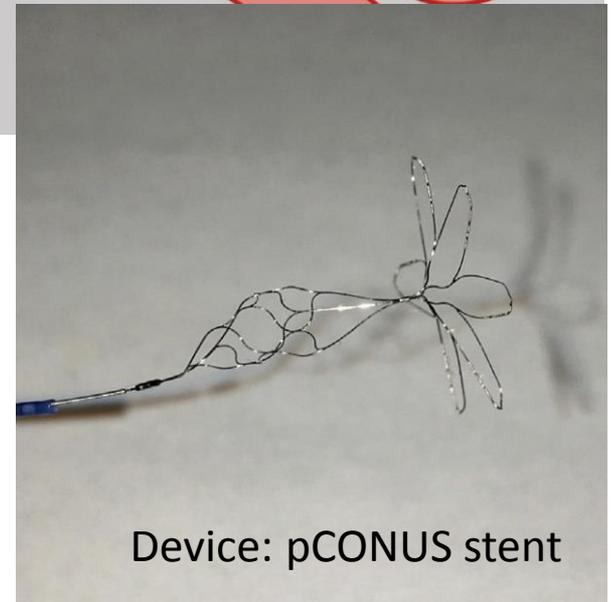
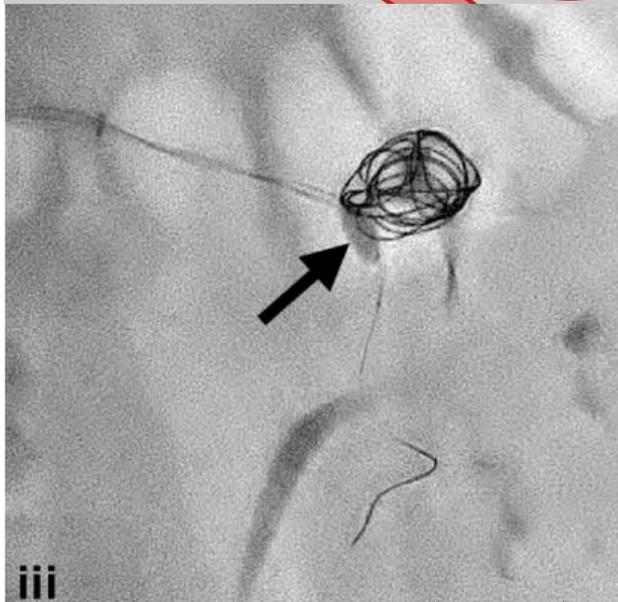
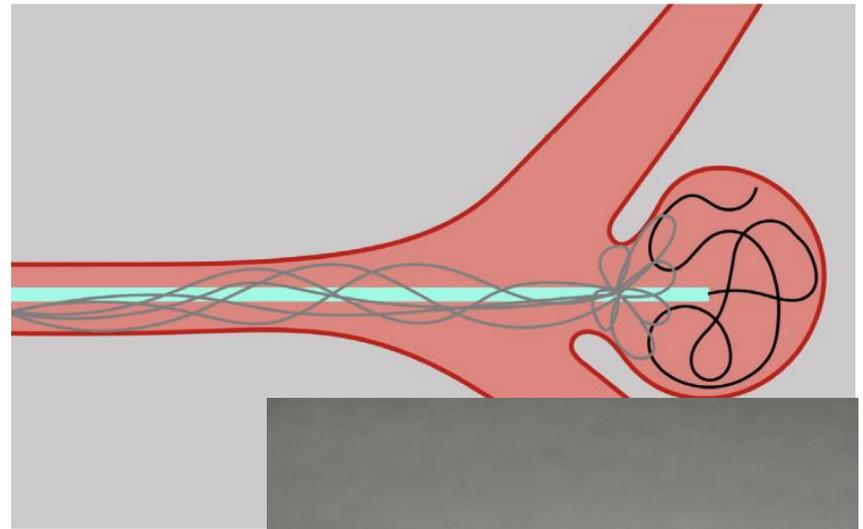
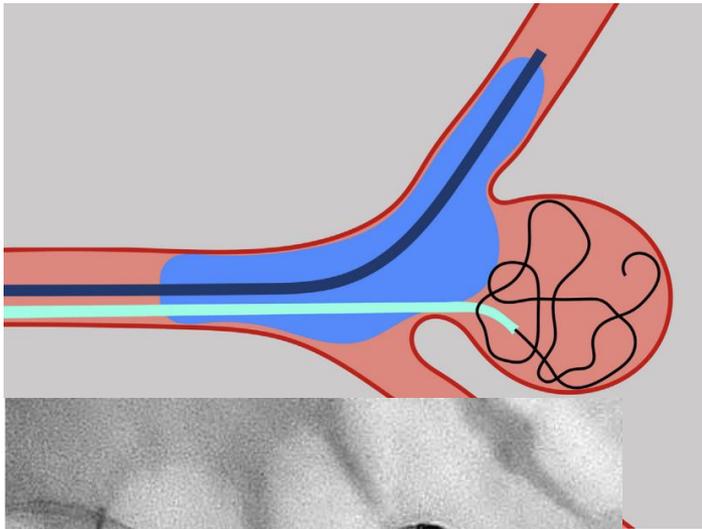
Treatment of Visceral Artery Aneurysms Using Novel Neurointerventional Devices and Techniques

Timothy Éanna Murray, MB, MCh, MRCS, FFR, EBIR,



Ballon assisteret embolisering

Stent assisteret embolisering



Endovascular Treatment of Visceral Artery Aneurysms and Pseudoaneurysms in 100 Patients: Covered Stenting vs Transcatheter Embolization

- 51VAA 49 VAPA
- CS principielt førstevalg
- Kort afstand fra aorta og ikke-slyngede kar taler for CS
- Oversizer med 1 mm
- CS \emptyset 5-9 mm
- Hvis kar $\emptyset < 5,5$ mm distalt benyttes coronare stentgrafts
- 70 TAE
- 30 CS
 - VAA 24, VAPA 6
 - 19 elektive, 11 akutte
 - 27 Viabahn, 3 coronare
 - 1 22pt, 2 5pt, 3 2pt
 - Patency
 - 6 mdr 88%
 - >3 år 40%

Table 1. Patients Undergoing Transcatheter Embolization or Covered Stenting for Visceral Artery Aneurysms.^a

	Total Cohort (n=100)	Transcatheter Embolization ^b (n=70)	Covered Stenting ^b (n=30)
Age, y; men	59±14; 58	59±14; 39	59±15; 19
Aneurysm type	51 VAA, 49 VAPA (39 postsurgical, 5 posttraumatic, 5 postinflammatory)	34 VAA, 36 VAPA	17 VAA, 13 VAPA
Aneurysm size, mm	23±12	23±12	26±12
Affected arteries; sites	31 SA, 21 HA, 14 RA, 12 SMA, 11 GDA, 8 PDA, 3 LGA; 34 proximal, 33 middle, 33 distal	21 SA, 12 HA, 8 RA, 12 SMA, 6 GDA, 8 PDA, 3 LGA; 20 proximal, 23 middle, 27 distal	10 SA, 9 HA, 6 RA, 5 GDA; 14 proximal, 10 middle, 6 distal
Procedure	59 elective, 41 emergency	39 elective, 31 emergency	20 elective, 10 emergency
Technical success	96 (96)	67 (96)	29 (97)
Clinical success	83 (83)	57 (81)	26 (87)
Failure/reinterventions	15 (15)	12 (17)	3 (10)
Major complications	4 (4)	3 (4)	1 (3)
Thirty-day mortality	7 (7) ^c	5/70 (7)	2/30 (7)
Vessel preservation	36 (36)	12 (17)	24 (80)
Target organ ischemia	27(27)	23 (33) ^d	4 (13)
Subgroup SA, HA, RA, and GDA ^e			
Technical success	79/81 (97)	50/51 (98)	29/30 (97)
Clinical success	67/81 (83)	41/51 (80)	26/30 (87)
Failure/reinterventions	12/81 (15)	9/51 (18)	3/30 (10)
Major complications	3/81 (4)	2/51 (4)	1/30 (3)

Abbreviations: GDA, gastroduodenal artery; HA, hepatic artery; LGA, left gastric artery; PDA, pancreaticoduodenal artery; RA, renal artery; SA, splenic artery; SMA, superior mesenteric artery; VAA, visceral artery aneurysm; VAPA, visceral artery pseudoaneurysm.

^aContinuous data are presented as the means ± standard deviation; categorical data are given as the counts (percentage).

^bCombined techniques: 5 covered stenting patients required concomitant embolization of efferent vessels, 1 covered stenting failure needed subsequent embolization, and 4 embolization failures had subsequent covered stenting. Five embolization patients required hematoma drainage and 1 covered stenting patient underwent stent-graft removal and hematoma drainage.

^cOne elective, 6 emergency.

^dOne clinically relevant.

^ePatients with SA, HA, RA, or GDA aneurysms suitable for treatment with either technique.

Systematic Review and Single-Center Experience for Endovascular Management of Visceral and Renal Artery Aneurysms

Hong Kuan Kok, FFRRCSI, FRCR, EBIR, Hamed Asadi, MD, PhD, FRANZCR, Mark Sheehan, MRCS, Mark F. Given, FFRRCSI, EBIR, and Michael J. Lee, FFRRCSI, FRCR, EBIR

- 939 pt
- 22 studier inkluderet i perioden 2005-2016
 - Antal patienter pr. studie n 4-63
 - Forfatteres lokale erfaring n 19 (1999-2015)
- 646 (84,5%) endovaskulært behandlede:
 - VAA 432
 - VAPA 151
 - Uklassificerede 63

Aneurisme "demografi"

- Størrelse
 - VAA 28,8 +/- 8,4 mm
 - VAPA 29,6 +/-16,5 mm
- Ruptur ved præsentation
 - 103/646 (15,9%)
- Emboliseringsmateriale
 - Coils, stentgrafts 13, NBCA 5, plugs 5, thrombin 4, flow diverting stents 3, EVAC 2, partikler 1

Samlede resultater

- Teknisk succes 93,2%
- Organ bevaret 99,3%
- Komplikationer 118 (18,2%)
 - 65 klinisk insignif. infarkt (47 milt, 8 nyre, 3 lever)
 - 11 adgangskomplikationer (10 hæmatom, 1 PA)
 - 23 major complications (blødning, cardielle/cerebrale events, blødning, infarkt, infektion, absces)
 - 10 patienter døde indenfor 30 dage
 - 4 under behandling, 4 efter behandling, IC blødning, lever/nyresvigt
- Kun 4 studier rapporterer efter SIR

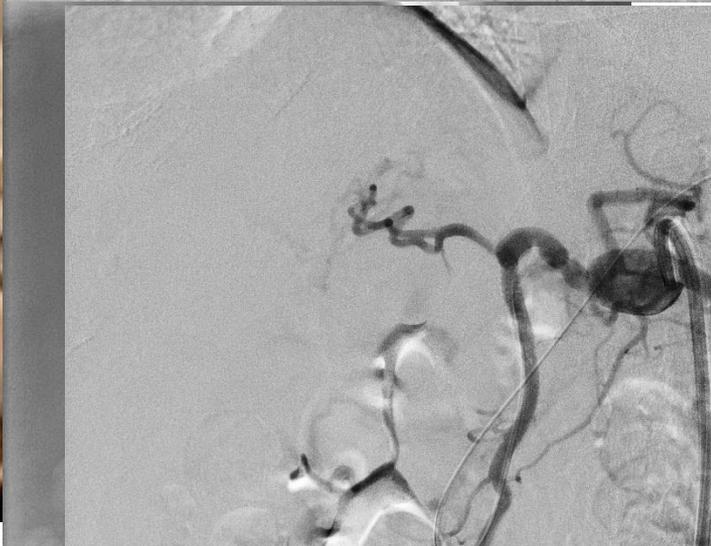
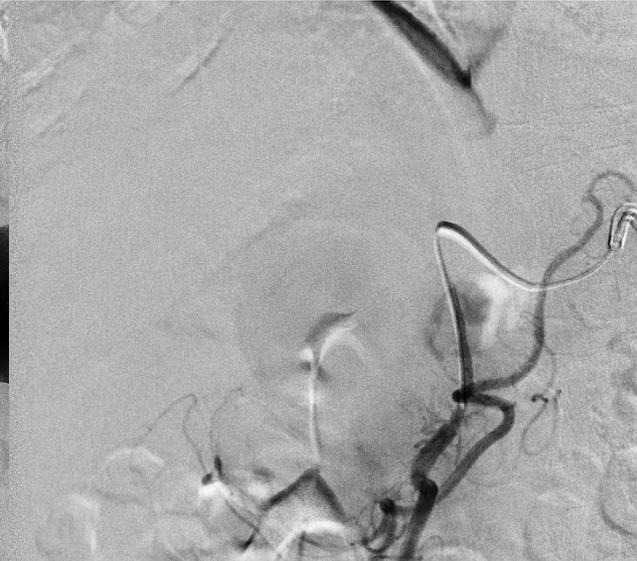
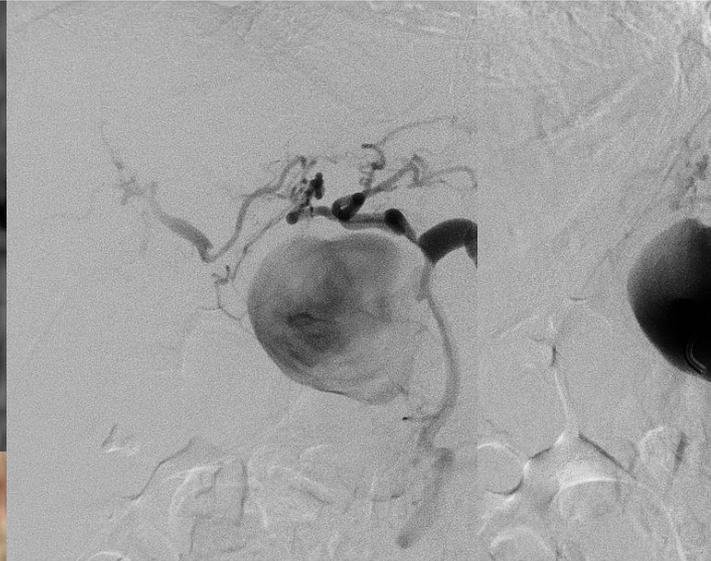
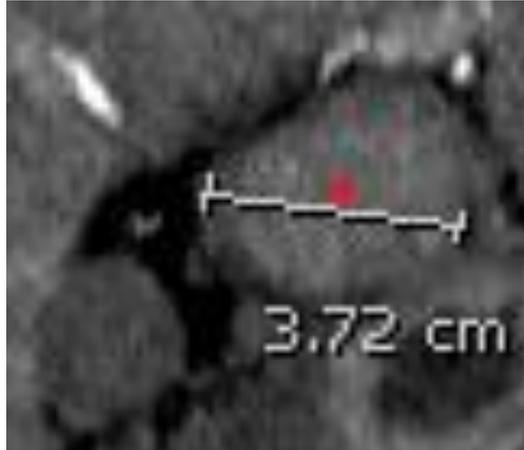
Follow-up – 20,5 mdr.

- 35 (5,4%) reperfusion, endoleak, vækst, sen reblødning
- 3 asymptomatisk thrombose
 - 2 stentgraft, 1 flowdiverter
- 1 stentgraft migrering => reintervention
- 1 nyt aneurisme ved follow-up, progression?

Reintervention

- < 30 d + > 30 d: 4,6%
- > 30 d: 4,1% 27 reinterventioner op til 24 mdr
 - Aneurisme reperfusion eller reblødning
- 3 cases (0,5%) kirurgisk intervention
 - HAA vækst trods EV reintervent
 - RAA perfusion trods EV behandlingsforsøg
 - Pancreas PA to emboliseringsforsøg

HAA – størrelse?



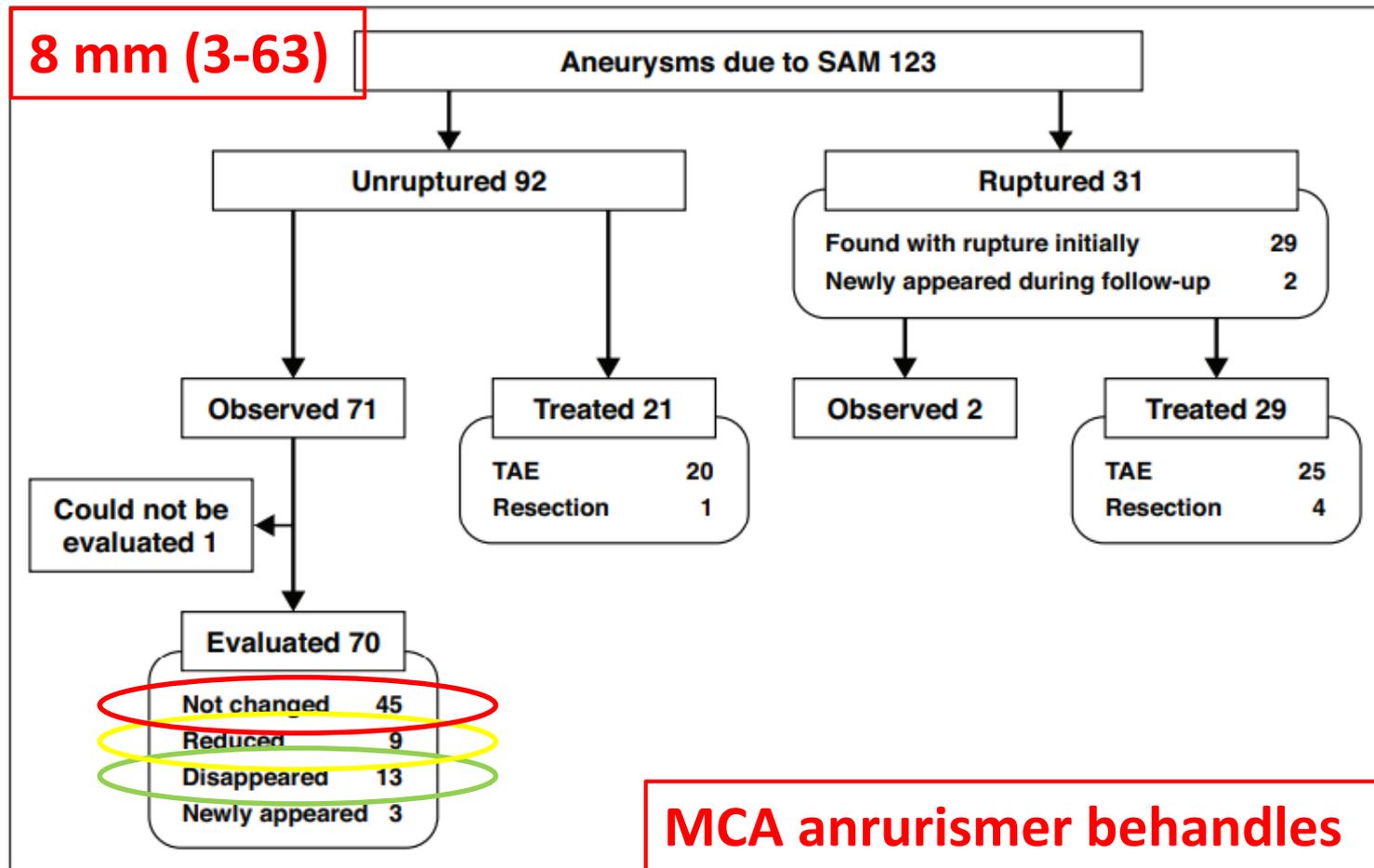
SAM

Sim sAlabiM salaBam Saladu SaladiM

- Kan aneurismer forsvinde?
- SAM
 - Non-atherosklerotisk
 - Non-inflammatorisk
- Billeddiagnostisk
 - Multiple fusiforme aneurismer
- Prædilektion for viscerale arterier
- Vacuoler ydre media*
- Diagnostiske kriterier
 - CAA, SMAA, IMAA**
 - Alder > 20 år
 - Fravær af symptomer fra
 - Kropsbygning
 - Hud
 - Led
 - Øjne
 - Lunger
 - Nyrer
 - ÷ iso RAA (÷ fibmuskdysp)
 - Ingen TC stenose

SAM

Segmental Arteriel Mediolyse



Konklusion

- Sande, asymptomatiske, non-inflammatoriske, aneurismer hos ikke-gravide vokser i de fleste tilfælde langsomt og forudsigeligt
- Nogle få tilfælde af non-inflammatoriske, non-atherosklerotiske aneurismer udløst af SAM kan regrediere
- Resten skal behandles uanset størrelse
- Blødende aneurismer skal behandles med det samme
- Endovaskulær behandling – hvad ellers?