

# The CERAB technique-procedural tips and clinical outcome

Michel MPJ Reijnen, MD, PhD

Department of Vascular Surgery, Rijnstate, Arnhem  
MultiModality Medical Imaging Group, University of Twente, Enschede  
The Netherlands



# Disclosure

Speaker name:

Michel Reijnen

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



# Kissing stent configuration

- Meta-analysis on 605 patients
  - 81% primary patency at 2-year
  - 84% intermittent claudication
  - 53% TASC A & B
- Patency affected by:
  - Radial mismatch
  - Differences in stent conformation
  - The protrusion length of the stents in the distal aorta
    - Re-circulation, turbulence and stasis
    - Mesenchymal tissue, thrombus and intimal hyperplasia



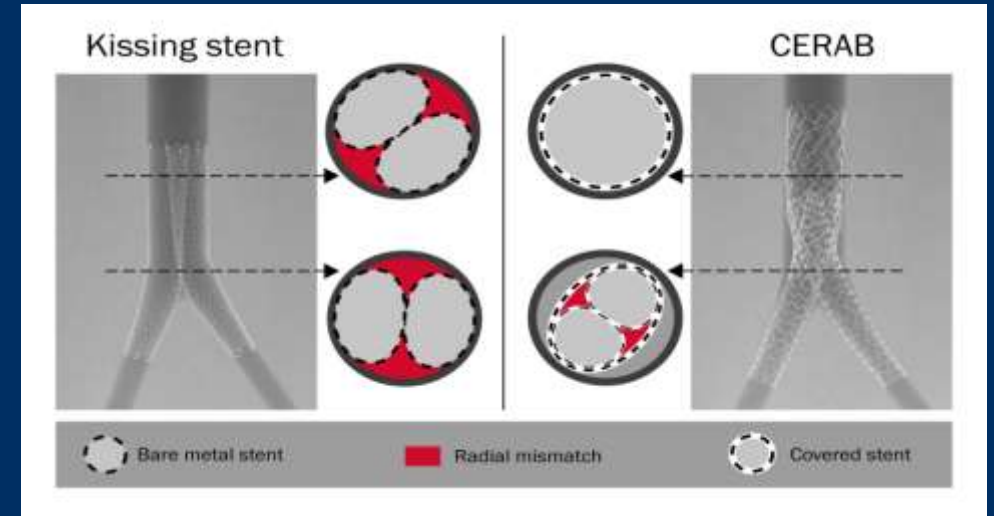
# Covered Endovascular Reconstruction of the Aortic Bifurcation - CERAB

Goal: to provide a more anatomical and physiological endovascular reconstruction of the aortic bifurcation



# Covered Endovascular Reconstruction of the Aortic Bifurcation - CERAB

- In vitro study and comparison of CERAB patients with matched KS patients
- No difference in preoperative anatomy or indication for intervention
- Significantly more mismatch in KS configuration

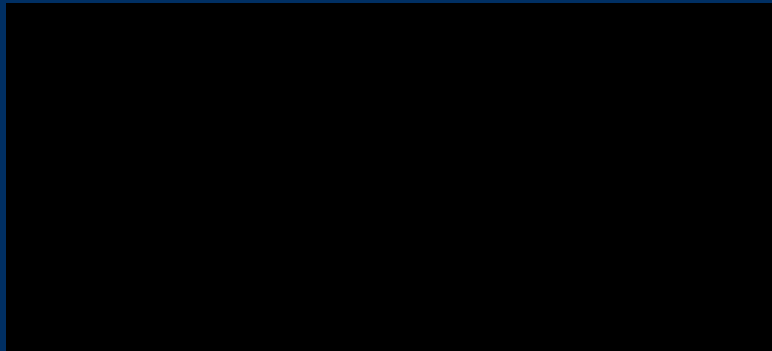


Method	Area (mm <sup>2</sup> )/volume (mm <sup>3</sup> )	CERAB mean (SD)	KS mean (SD)
Ellipse	Radial mismatch area	14.1 (4.2)	172.7 (70.0)*
	Radial mismatch volume	307.7 (131.2)	7268 (3810.9)*
ROI	Radial mismatch area	11.0 (4.8)	165.8 (71.5)*
	Radial mismatch volume	240(127.3)	7047.0 (3239.0)*

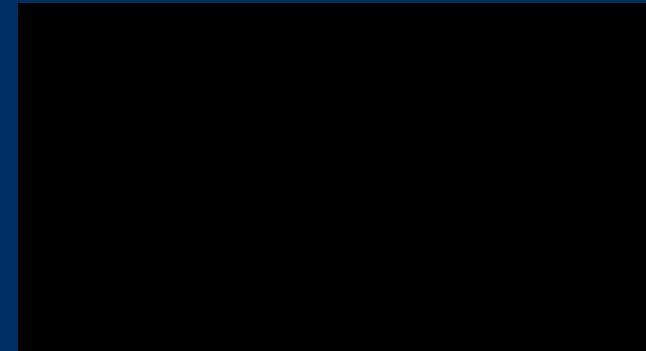
\*denotes P <0.05

# CERAB

## *Laser Particle Image Velocimetry*



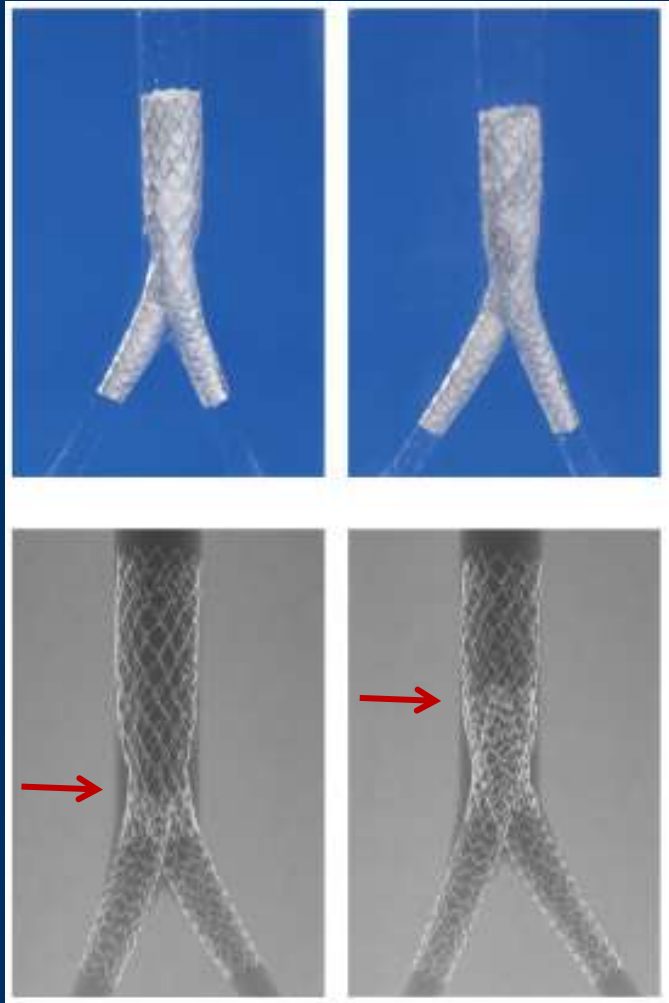
*CERAB and BM kissing stents; Mostly laminar flow throughout the cardiac cycle*



*BM Kissing stents; turbulence and recirculation at phases B and C*

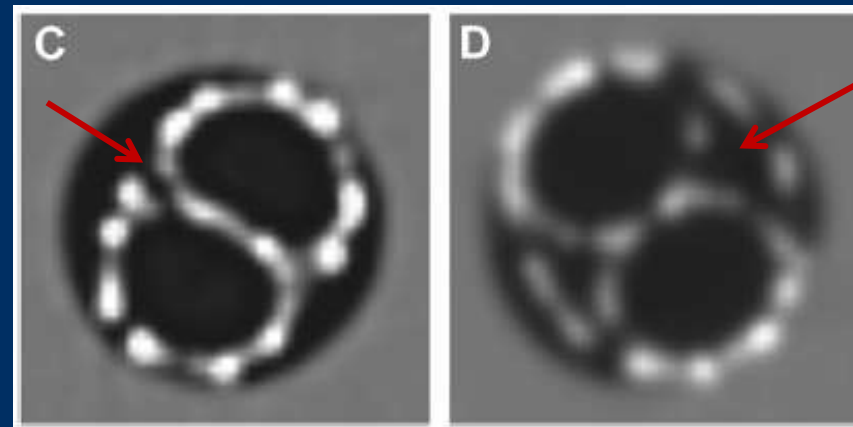
# CERAB

## *The impact of limb placement*



Suboptimal placed limbs:

- Inferior stent-to-wall apposition (Double-D configuration)
- 4-fold increase in mismatch area



# Clinical results of CERAB

## *Midterm outcome*

- February 2009 – July 2016
- 130 elective patients, two centers
- Age 61 (36-81) years, 69 male
- Chimney procedures excluded
- Previous aorto-iliac intervention in 41 %

### Rutherford classification:

• 1	n=1	0.8%
• 2	n=0	0.0%
• 3	n=84	66.1%
• 4	n=22	17.3%
• 5	n=18	14.2%
• 6	n=2	1.6%

### TASC -II classification:

• B	n=7	(5.4%)
• C	n=7	(5.4%)
• D	n=116	(89.2%)



# Clinical results of CERAB

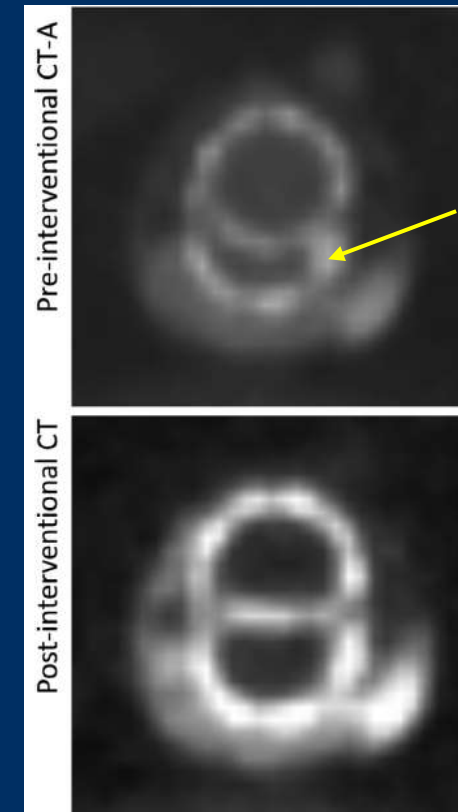
## *Complications*

- Procedural
  - Unintended dissection n=6
  - Bleeding n=4
  - Stent dislocation n=1
  - Stent deformation n=1
  - Thrombus formation n=2
- Post Procedural
  - Pneumonia n=3
  - Stent deformation n=3
  - Thrombosis n=2
  - CFA occlusion n=1
  - MODS n=1
  - Renal insufficiency n=1
- **No 30-day mortality**

# Clinical results of CERAB

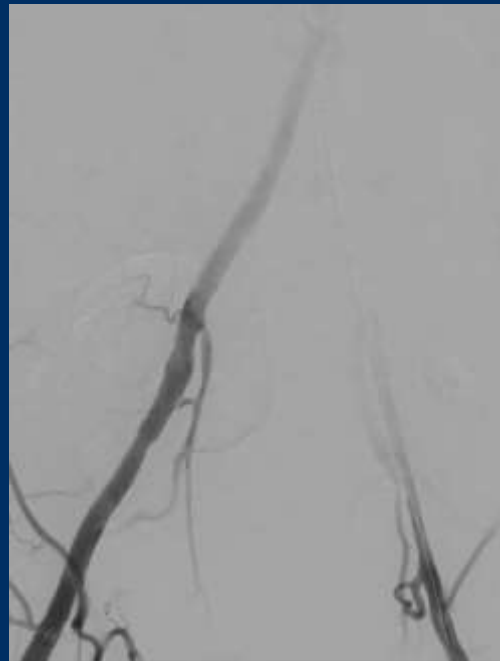
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# XperCT

*Cone beam CT tool*

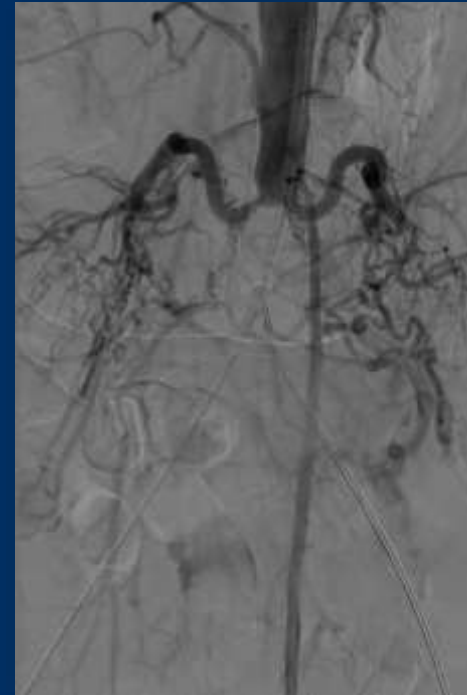


# Clinical results of CERAB

## *Complications*

- Procedural
  - Unintended dissection n=6
  - Bleeding n=4
  - Stent dislocation n=1
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# Closure devices



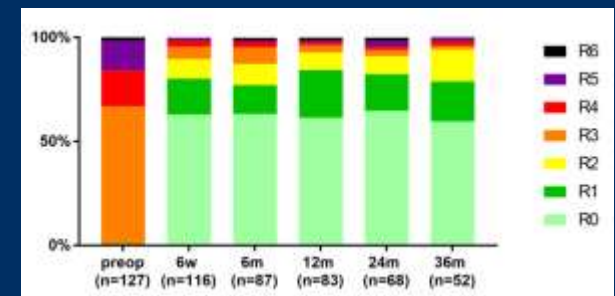
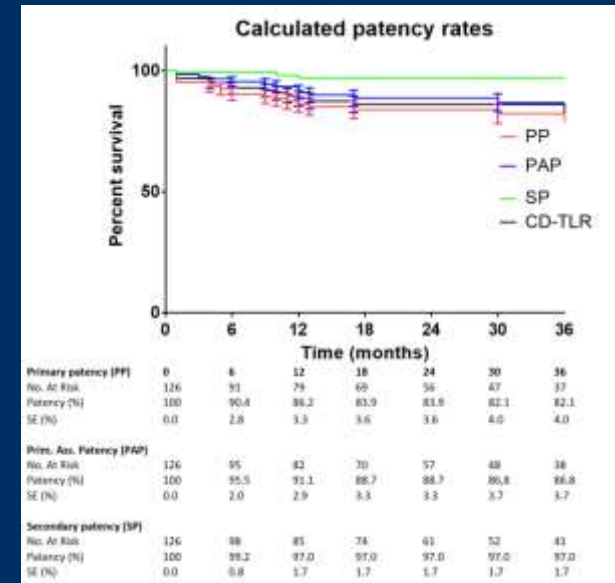
# Closure devices



# Clinical results of CERAB

## Midterm outcome

- Median follow-up 24 months
- Total primary patency
  - 12 months 91%
  - 24 months 89%
  - 36 months 87%
- Secondary patency
  - 12 months 97%
  - 24 months 97%
  - 36 months 97%
- Clinical improvement at 36 months 96%
- Limb salvage rate at 36 months 97%



# Clinical results of CERAB

## *Midterm outcome*

### Previous treatment of AIOD

- Surgical reconstruction of the aortoiliac segment (n=7)
- Endovascular intervention (N=46, 35%)
  - 46% PBA of the common iliac artery  
(17% kissing balloons)
  - 37% Stenting of the common iliac artery  
(31% kissing stents)

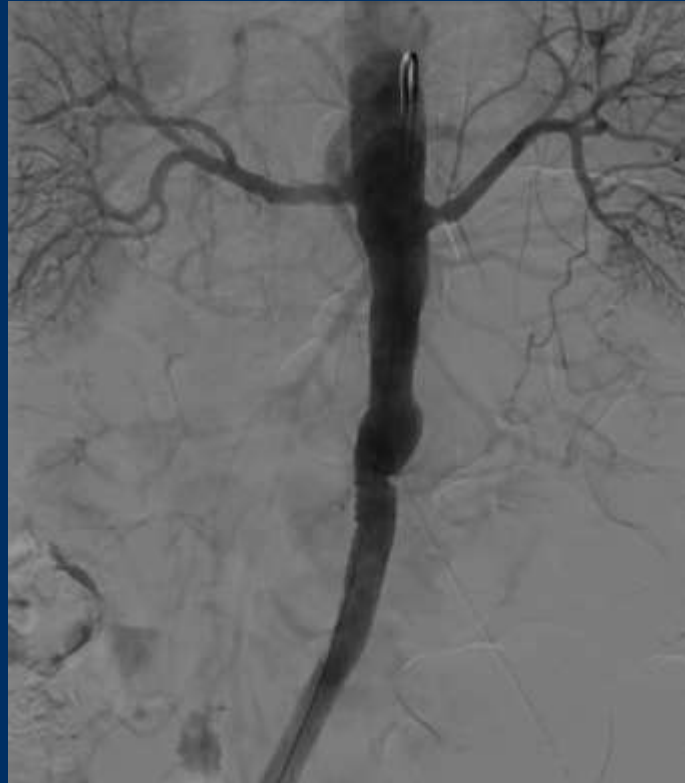
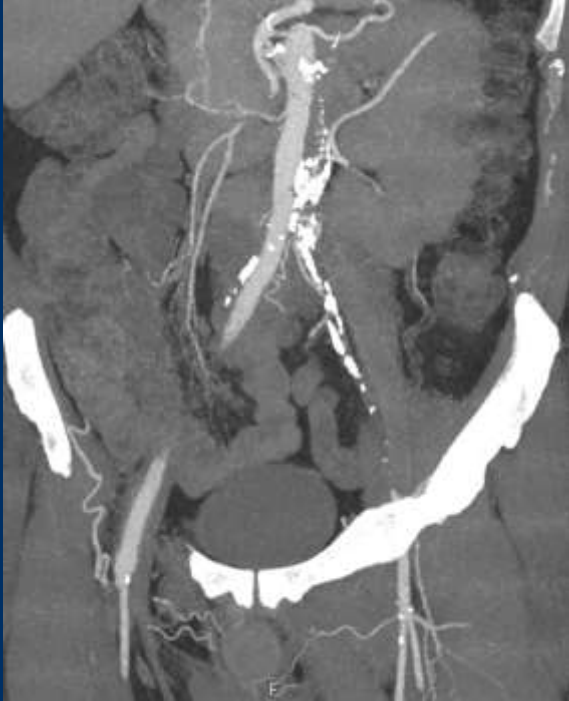
	Yes (n = 46), %	No (n = 80), %
One-year follow-up		
Primary patency	80	88
Primary assisted patency	91	97
Secondary patency	98	98
Three-year follow-up		
Primary patency	76	85
Primary assisted patency	83	88
Secondary patency	94	98





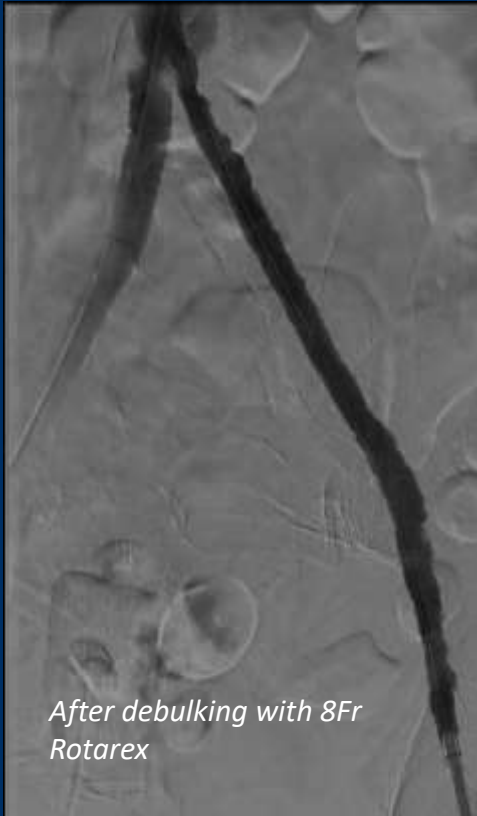
# Clinical results of CERAB

## *Debulking*



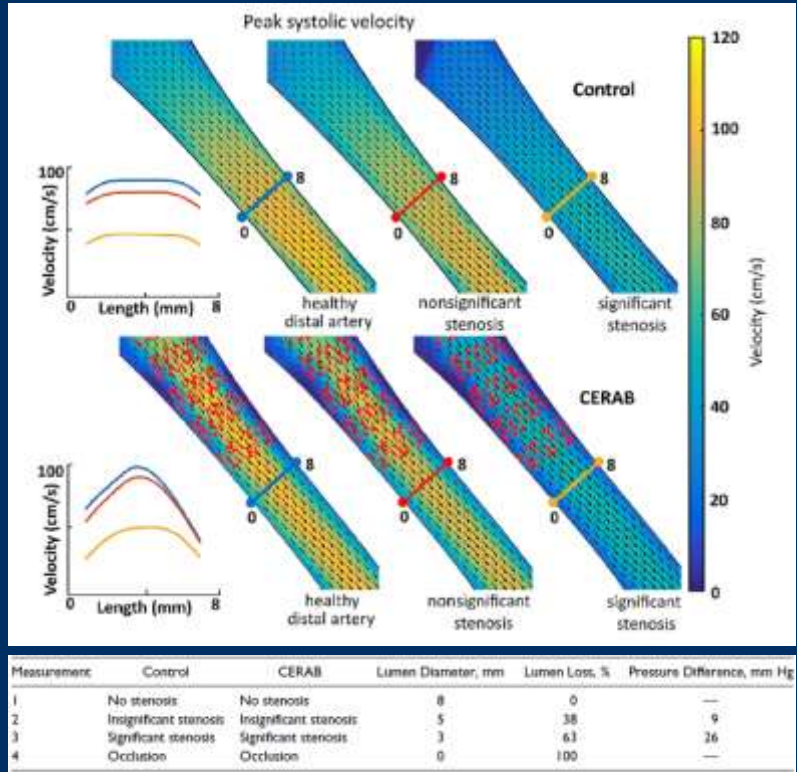
# Clinical results of CERAB

## *Debulking*



# Clinical results of CERAB

## *Role of outflow stenosis*



HD significant outflow stenosis causes;

- 2-fold decrease in peak outflow velocity
- 3-fold decrease in TA-WSS

in both CERAB and control

In CERAB the TA-WSS was 2-fold lower compared to the control model, independent of the lesion severity

Outflow stenosis after CERAB will have a higher tendency to progress in time and may require early treatment

# Summary

- CERAB is related to the most optimal geometry and flow patterns for extensive AIOD and good clinical outcome is good up to 3-year follow-up
- Proper placement and optimal deployment of the limbs and early treatment of outflow stenosis are important to improve outcome
- Cone beam CT and debulking may improve outcomes, particularly in re-do cases
- Endovascular options seem unlimited, but the preferred treatment remains tailor-made, particularly in complex cases

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