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# Interventions for AV-Shunt stenosis: What works best – PTA, Stent or DCB?

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# Disclosure

Speaker name: Martin Forlee

I have the following potential conflicts of interest to report:

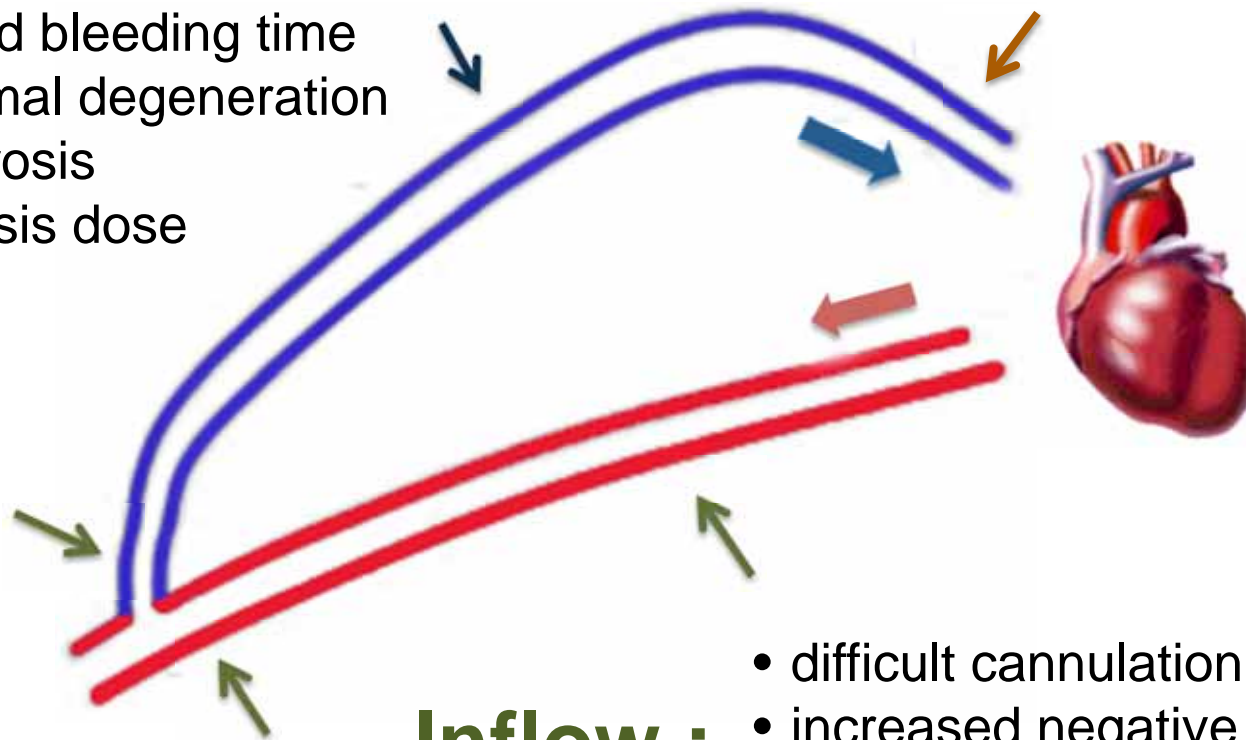
- Consulting
- Employment in industry
- Stockholder of a healthcare company
- Owner of a healthcare company
- Other(s)
  
- I do not have any potential conflict of interest

## Outflow:

- increased venous pressure
- prolonged bleeding time
- aneurysmal degeneration
- skin necrosis
- low dialysis dose

## Mid-vein :

- prolonged bleeding time
- aneurysmal degeneration
- skin necrosis
- low dialysis dose



## Inflow :

- difficult cannulation
- increased negative arterial pressure
- low dialysis dose

# Indication for treatment

haemodynamically  
significant stenosis

+

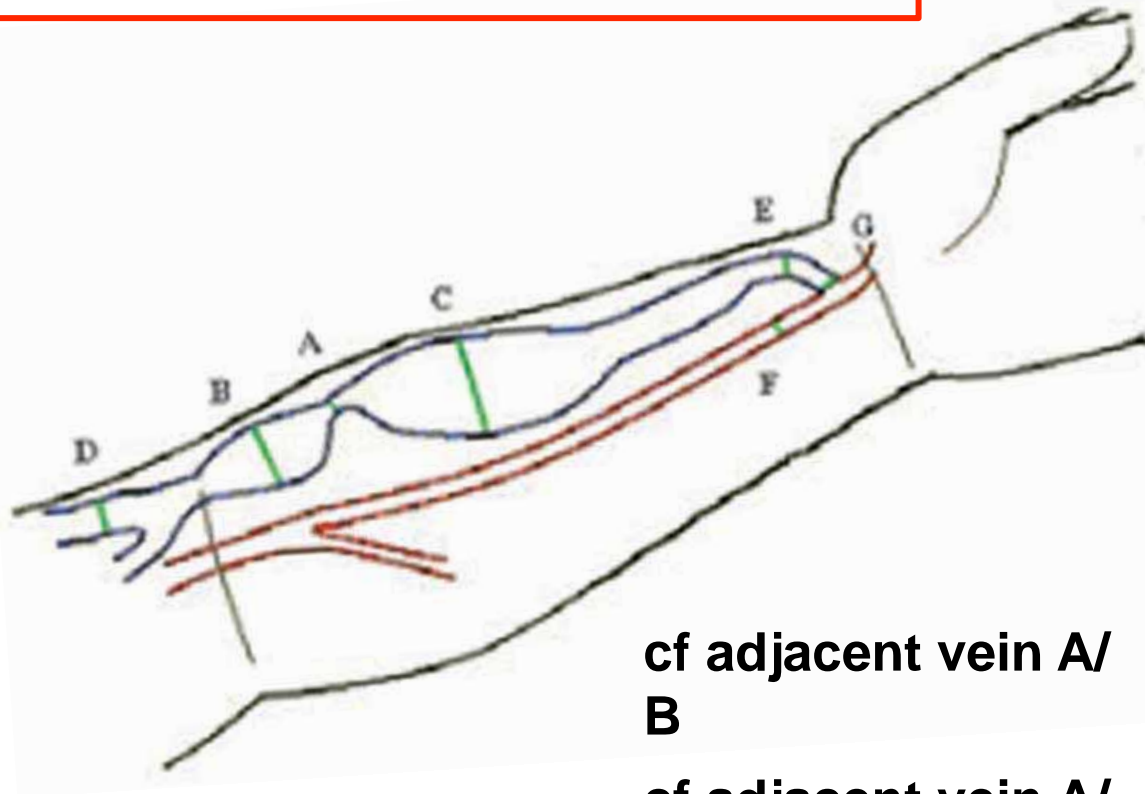
## Clinical indication

- Failure to mature
- Failing fistula/AV graft

# What is the degree of stenosis at A?

**Stenosis at A = -25% to +75%**

- A = 4mm
- B = 12mm
- C = 16mm
- D = 6mm
- E = 4mm
- F = 3mm
- G = 4mm

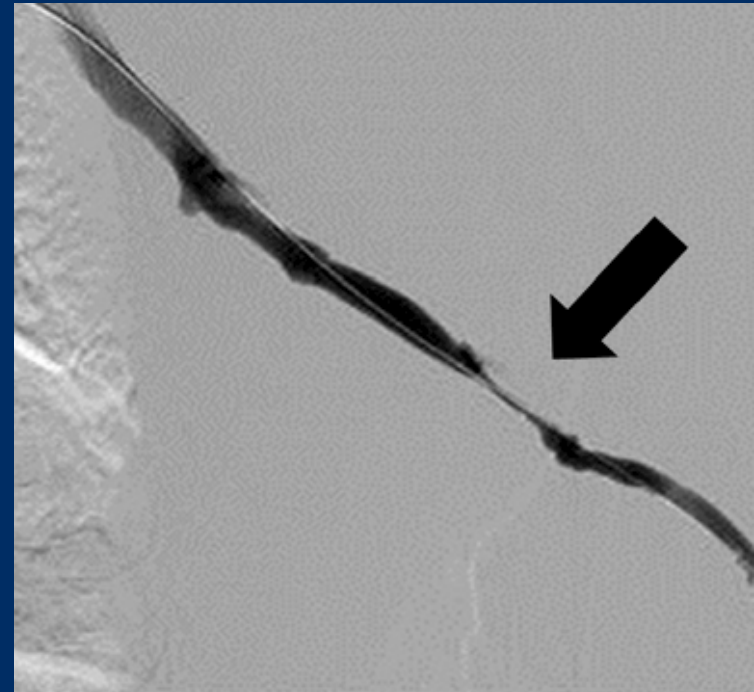


cf adjacent vein A/ B	→	66%
cf adjacent vein A/ C	→	75%
cf outflow vein A/ D	→	30%
cf inflow vein A/E		0%

# AV Fistula Stenosis

## How do we define a stenosis?

- Diameter compared to adjacent segment of vein:  $> 50\%$
- Absolute minimum diameter
- Duplex: PSV ratio  $> 2$



# Incidence of problems

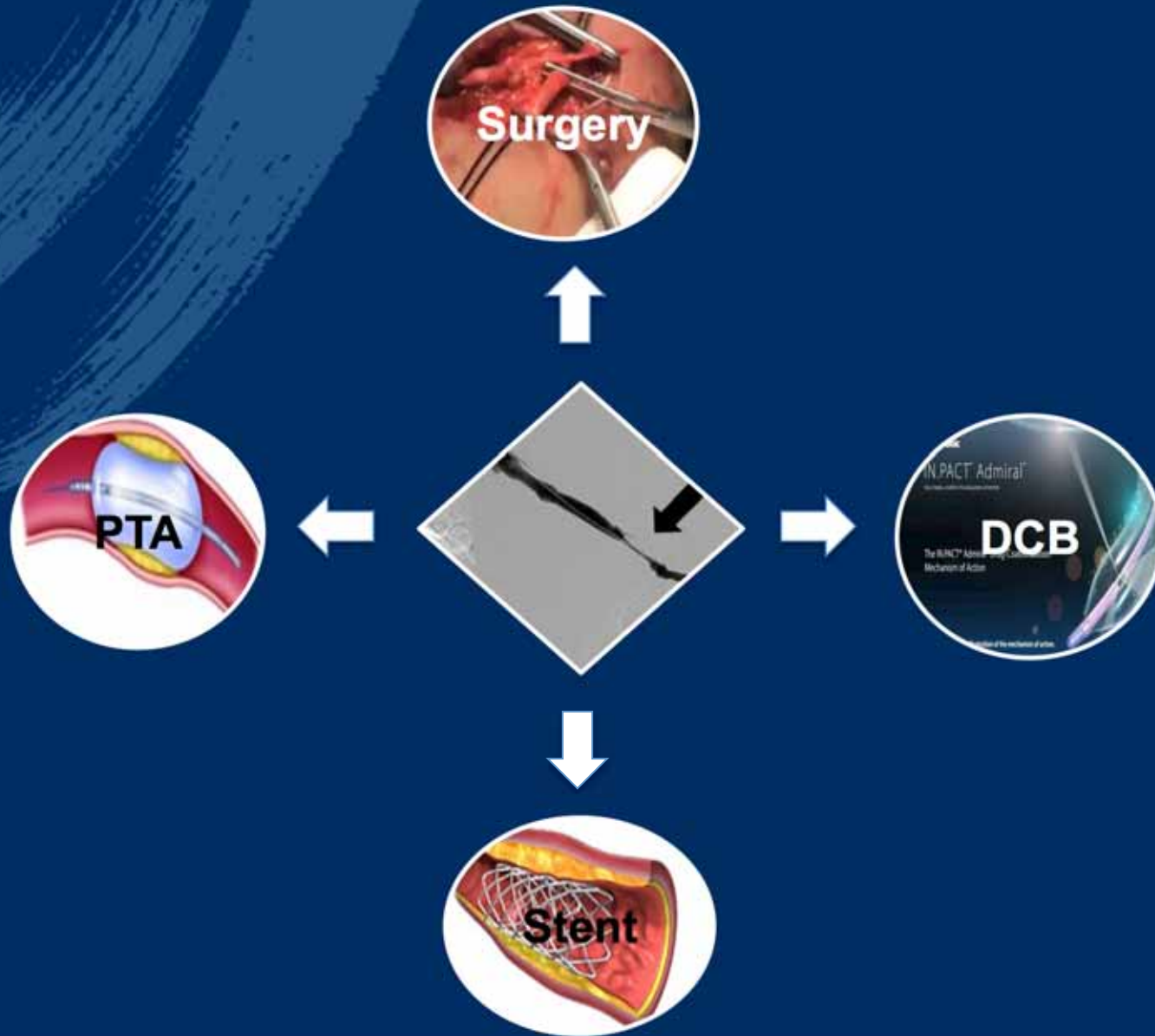
## Early Failure

Feeding artery stenosis	4-6 %
Arterial anastamosis stenosis	38-47 %
Juxta-anastamotic stenosis	27-68 %
Vein Stenosis	4-59 %
Accessory vein	4-78 %
Central vein stenosis	3-9 %
Multiple problems	34-71 %

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# Treatment Options



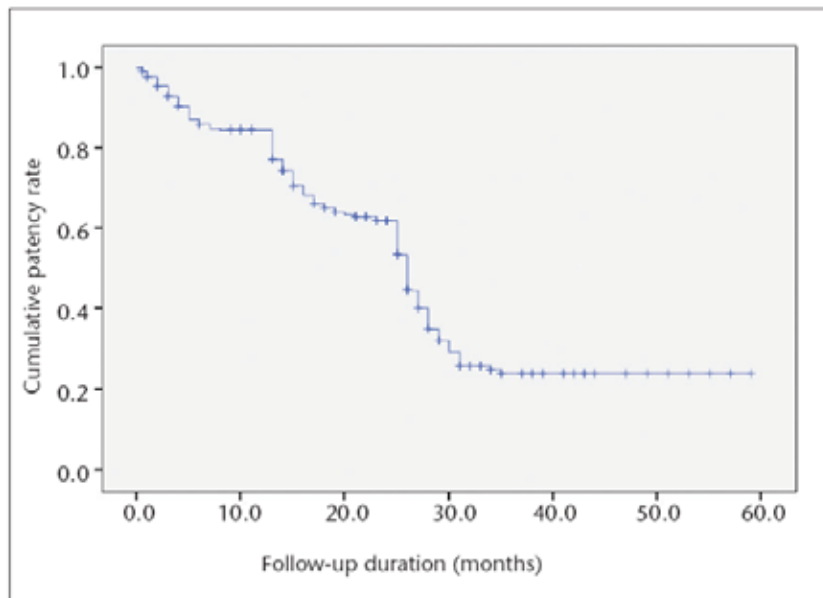


# Percutaneous transluminal balloon angioplasty in stenosis of native hemodialysis arteriovenous fistulas: technical success and analysis of factors affecting postprocedural fistula patency

330 stenoses in 228 patients

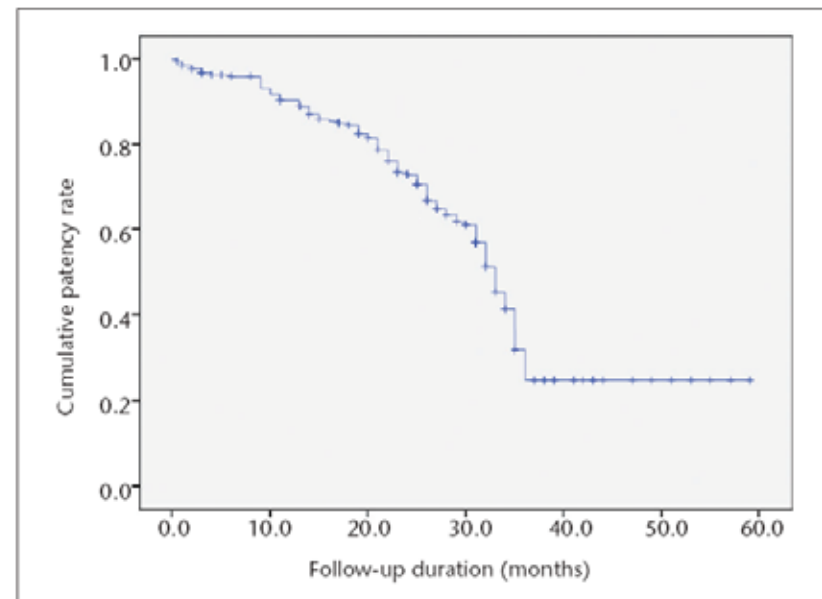
Technical success 96.3%

Clinical success 97.2%



**Primary Patency**

1 yr	2 yr	3 yr
84.7%	62.2%	23.7%



**Secondary Patency**

1 yr	2 yr	3 yr
90.5%	72.7%	32.1%



# Factors Associated with Patency Following Angioplasty of Hemodialysis Fistulae

207 patients had 1<sup>st</sup> angioplasty of AVF  
247 secondary endovascular interventions

## Primary Patency

6 mo	12 mo	24 mo
66%	49%	29%

Upper arm AVF's	0.0007
	2
AVF < 6 months	0.0014
Multiple stenoses	0.019
Degree initial stenosis	0.016

## Secondary Patency

6 mo	12 mo	24 mo
94%	84%	79%

Previously failed AVF	0.0053
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## **Predictors of Patency after Balloon Angioplasty in Hemodialysis Fistulas: A Systematic Review**

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11 non-randomized observational studies  
965 fistulas in 939 patients  
summarized descriptively

- patency post procedure highly variable
- only 26-58% native AVF's functional at 12 months without further intervention
- factors assessed: clinical, anatomic, biochemical



# Predictors of Patency after Balloon Angioplasty in Hemodialysis Fistulas: A Systematic Review

## Primary Patency:

Age of AVF	HR 0.97 per month	P=0.038
Lesion length > 4 cm	RR 5.5	P=0.004
Upper arm	HR 1.81	P=0.005
<b>No effect:</b> lesion location, multiple lesions, degree of stenosis, diabetes, pt age, gender		
Ca channel blocker	OR 5.1	P<0.05

## Secondary Patency:

Increased pt age		P=0.014
AVF < 6 months		P=0.037



# When AVF Angioplasty Fails...

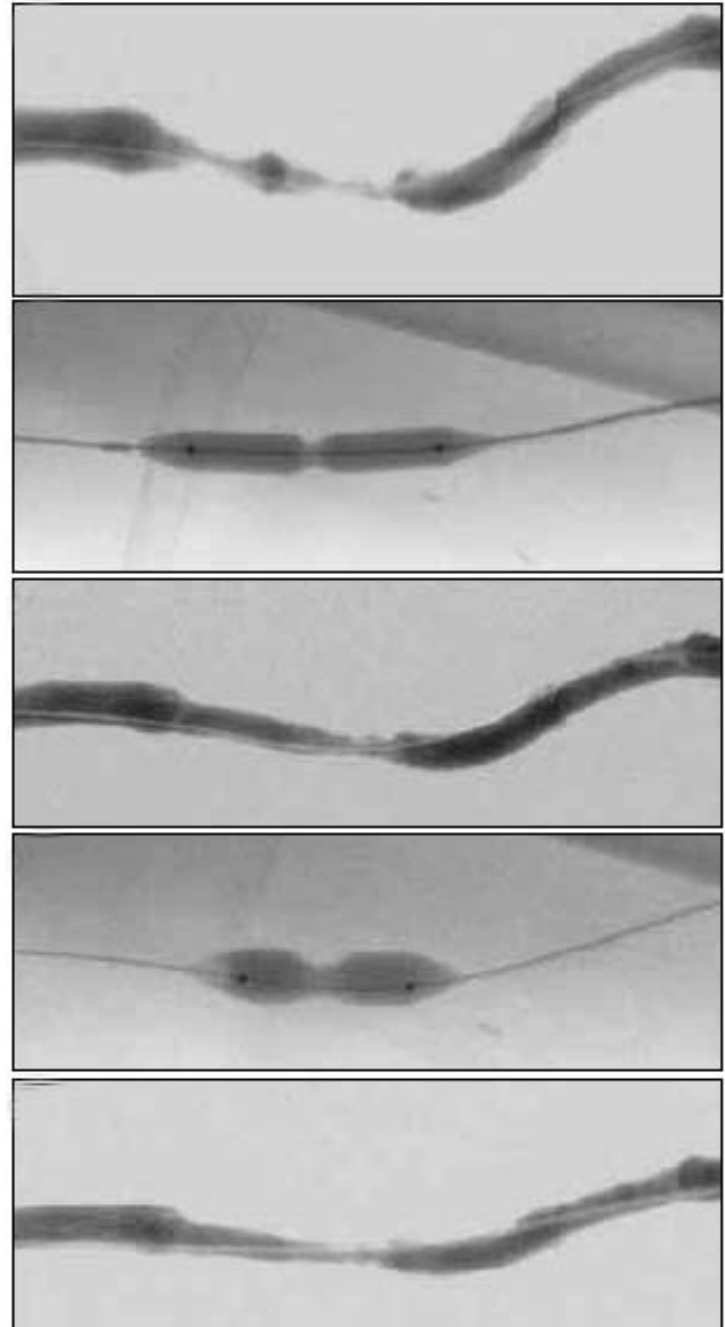
Balloon dilation:

- Safe
- Effective
- Success rate 85-90%

**10-15%**

**Technical Failure Rate**

(> 30% residual stenosis)



# Improving Technical Success



## Ultra High Pressure Balloons

- Eg Bard Conquest, Atlas, Dorado
- Rated burst pressure 30 mmHg



## Scoring Balloons

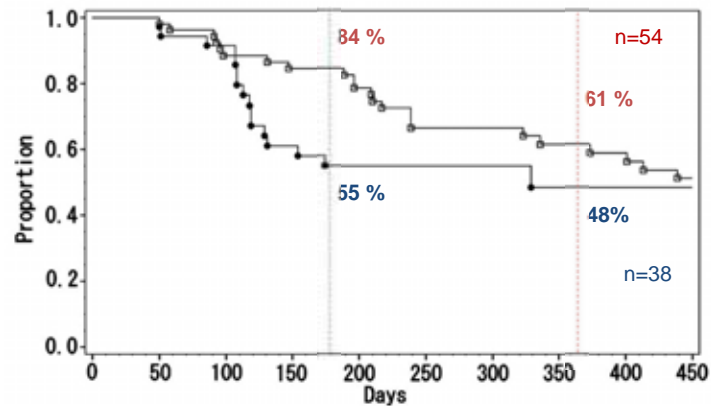
- Eg Cook, Spectranetics Angiosculpt



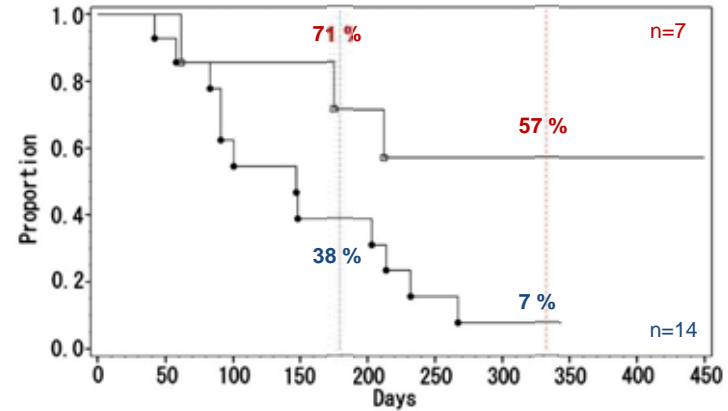
## Cutting Balloons

- Boston Scientific
- High technical success rate

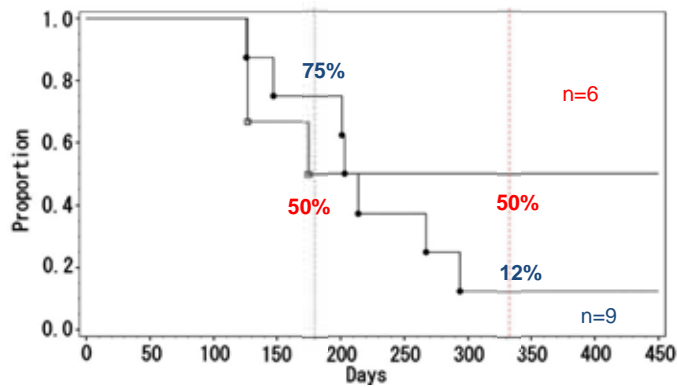
# Primary Patency with Cutting and Conventional Balloon Angioplasty for Different Types of Hemodialysis Access Stenosis



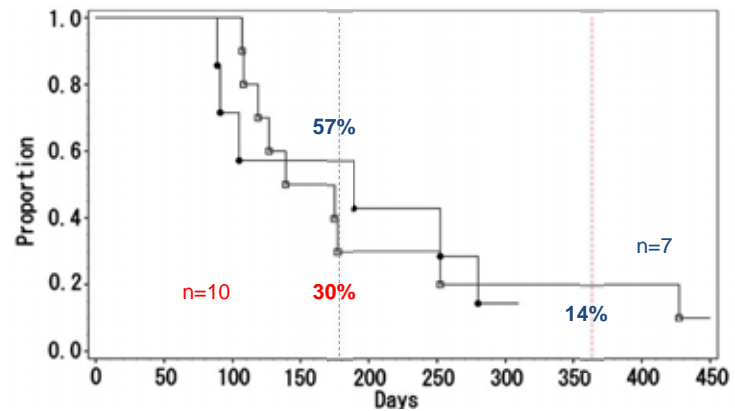
**Autogenous vein stenosis**



**Graft-vein stenosis**



**In-graft stenosis**



**In-stent stenosis**

# Cutting Balloons

## Summary

- Safe
- Improve technical success
- No improved patency
- Expensive





# Stents

## Indications for Stents

- acute elastic recoil of the vein (>50% stenosis)
- stenosis recurrence within 3 months

Surgery should be considered if angioplasty of same lesion in 3 months. Stent if:

- surgically inaccessible
- pt not fit for surgery
- angioplasty has induced rupture

# Stents in AV Graft Stenosis

Author	Yr	Design	n	Outcomes
Vogel	2005	Retrospective	60	Less restenosis (7% vs 16% P=0.001) Better 1 <sup>o</sup> patency (8.2mo vs 5.6 mo P=0.05)
Maya	2006	Retrospective	48	Better 1 <sup>o</sup> patency (85 vs 27 days P=0.02) Better 2 <sup>o</sup> patency (1215 vs 46 days P=0.049)
Chan	2008	Retrospective	211	Better 1 <sup>o</sup> assisted patency Better 1 <sup>o</sup> patency
Dolmatc h	2007	Prospective RCT	200	Better 1 <sup>o</sup> patency @ 6/12 50% vs 23% P<0.001)

**Conclusion:** Stent placement in AV-Graft stenosis appears to improve patency

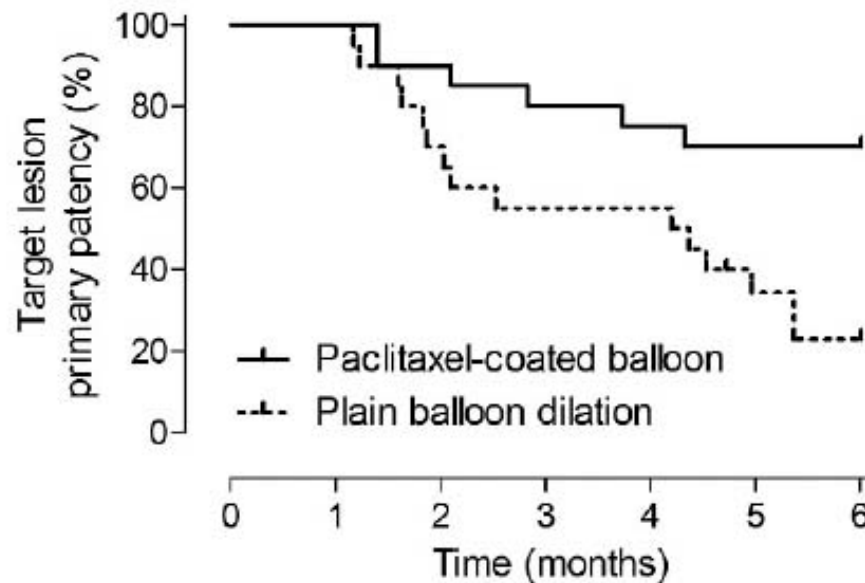
# Stents in AV Fistulae

Author	Yr	Design	n	Outcomes
Beathard	1993	Prospective RCT	58	No difference in patency at 90,180 and 360 days (P>0.7)
Quinn	1995	Prospective RCT	87	No difference in patency at 90,180 and 360 days (P=0.6258)
Hoffer	1997	Prospective RCT	37	No difference in 1 <sup>0</sup> , 1 <sup>0</sup> assisted and 2 <sup>0</sup> patency
Shemes h	2008	Prospective RCT	21	1 <sup>0</sup> patency better in stent graft group vs BMS for cephalic arch stenosis

## Conclusion:

1. No benefit in routine BMS vs PTA
2. Stent graft may be better, but weak evidence

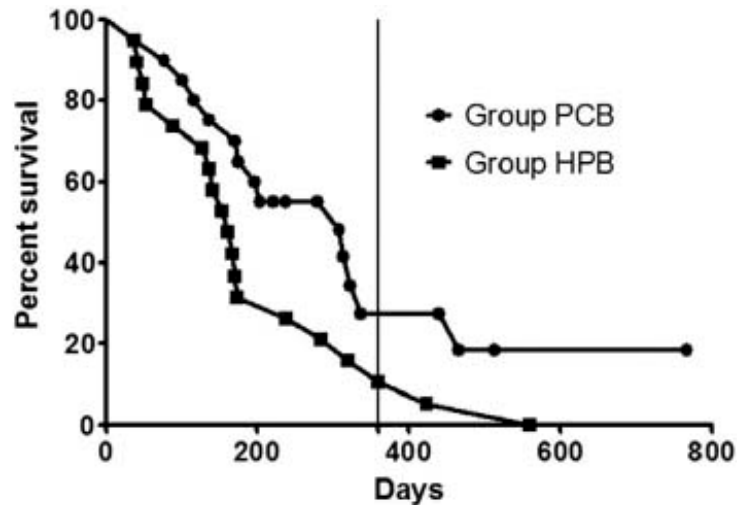
# Paclitaxel-Coated Balloon Angioplasty vs. Plain Balloon Dilatation for the Treatment of Failing Dialysis Access: 6-Month Interim Results From a Prospective Randomized Controlled Trial



**Target Lesion Primary Patency**

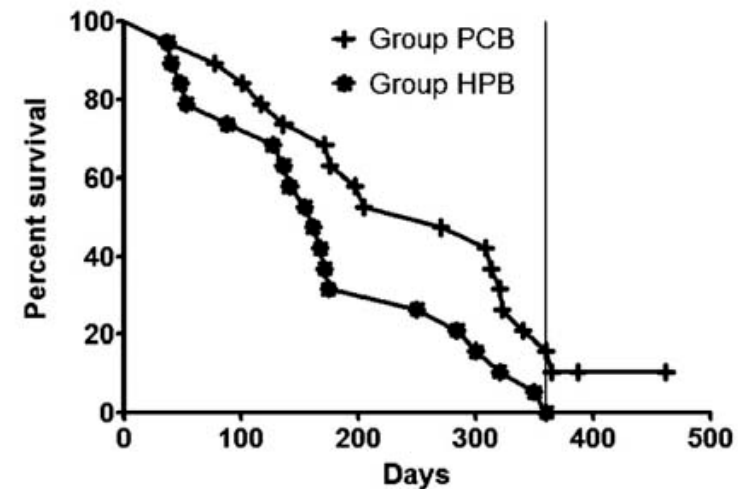
**70% in PCB vs 25% in PBA**  
**HR 0.30 CI 0.12-0.71 P< 0.001**

# Paclitaxel-Coated versus Plain Balloon Angioplasty for Dysfunctional Arteriovenous Fistulae: One-Year Results of a Prospective Randomized Controlled Trial



TLR Free Survival

**PCB 308 d vs HPB 161 d**  
**HR 0.47 CI 0.23-0.96 P=0.03**

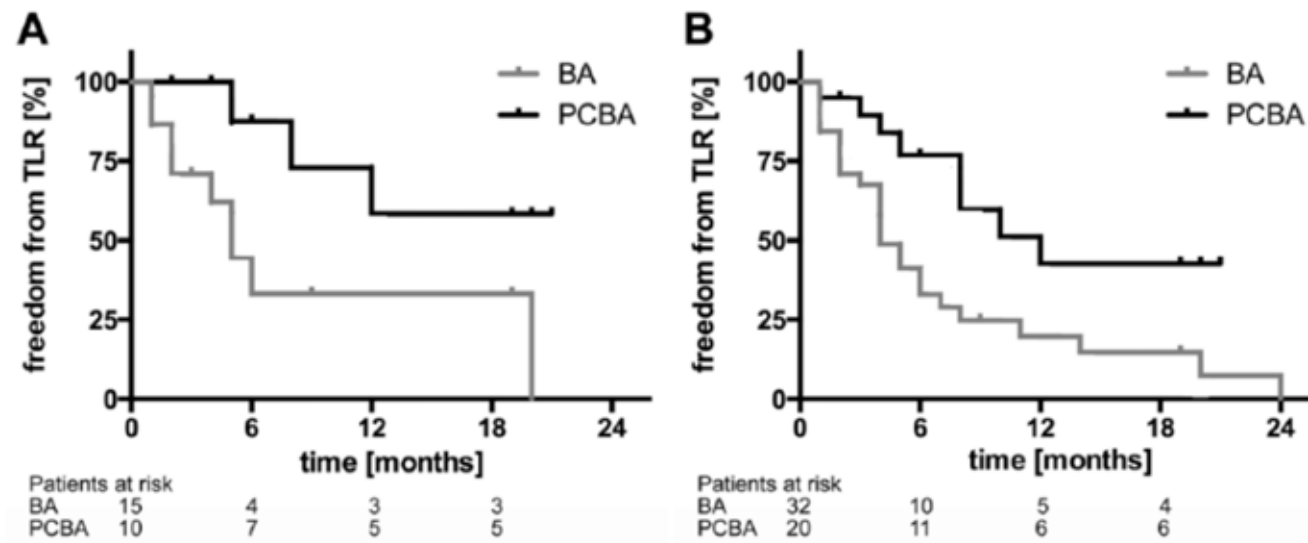


Circuit Primary patency

**PCB 270 d vs HPB 161 d**  
**HR 0.48 CI 0.23-0.97 P=0.04**

# Paclitaxel-Coated Balloon Angioplasty for Symptomatic Central Vein Restenosis in Patients With Hemodialysis Fistulas

27 patients 32 lesions 18 month follow-up



Median freedom from TLR 10 months vs 5 months P= 0.029

# Conclusions

- Evidence that one method is better than the other is WEAK at best
- No method proven to have better long or short term outcomes
- Method used depends on other factors:
  - interventionalist experience
  - location where patient presents for care

# Conclusions

- **Cutting Balloons:** improve technical success, no long term patency benefit
- **Stents** improve patency for AV Graft stenosis
- **No benefit of BMS** over PTA in AV Fistula stenosis
- **Drug eluting balloon angioplasty** appears promising



# Conclusions

- **Cutting Balloons:** improve technical success, no long term patency benefit
- **Stents** improve patency for AV Graft stenosis
- **No benefit of BMS** over PTA in AV Fistula stenosis
- **Drug eluting balloon angioplasty** appears promising