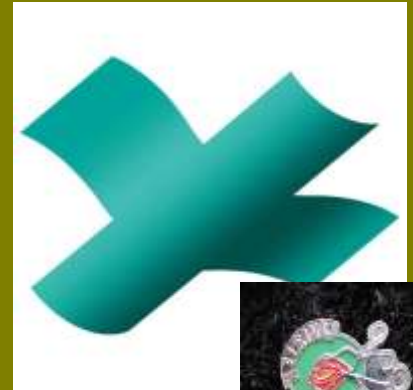


Distal bypass improves perfusion in all angiosomes in contrast to endovascular treatment that improves only targeted angiosome



Maarit Venermo
Professor of Vascular Surgery
Helsinki University Hospital, University of Helsinki



Disclosures

- ❑ PI (Finland) in Voyager-trial (Bayer)
- ❑ PI (Finland) in InfoRAAA trial (Faron)
- ❑ Consultant for Sanofi



Is there a difference in perfusion change between EVT and Open Bypass?



A prospective trial

In Helsinki we measured Foot perfusion using ICG-FI before and after revascularization



ICG-FI of an old lady who underwent adp-bypass with cephalic veins

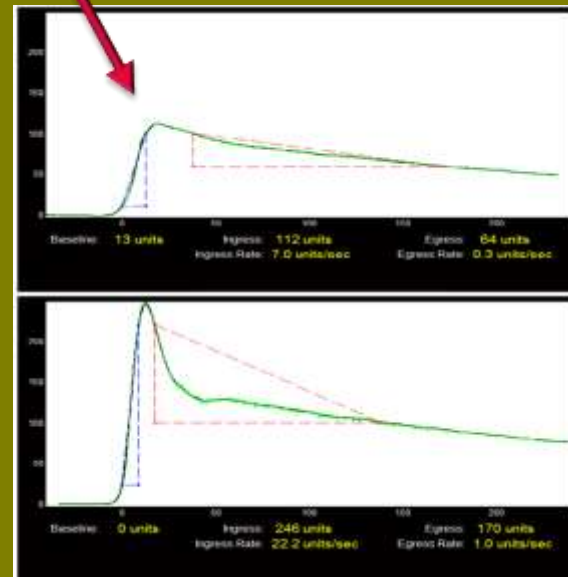
BEFORE



AFTER



Maximum intensity (AU) and time (s)



Improvement in the time-intensity curve.
Maximum intensity increased from 112 to 246

ORIGINAL SCIENTIFIC REPORT

Quality Control of the Foot Revascularization Using Indocyanine Green Fluorescence Imaging

Nida Settembre¹ · Petteri Kaulanen² · Anders Alh  k³ · Kristyna Spillerova¹ · Maarit Venemo¹

Table 2 Analysis of 104 limbs

Technique/number of patients	Type of examination	Mean	Number of patients	SD	SE mean
Paired samples statistics					
BYPASS 33 limbs	SPY ingress before	77.79	33	50.0	8.70
	SPY ingress after	134.17	33	51.96	9.04
	SPY ingress rate before	4.86	33	6.12	1.06
	SPY ingress rate after	10.15	33	5.28	0.92
	SPY10 before	26.58	33	33.93	5.90
	SPY10 after	69.74	33	34.39	5.98
	ABI before	0.41	11	0.14	0.04
	ABI after	0.63	11	0.29	0.08
	TP before	29.08	12	12.07	3.48
	TP after	30.33	12	12.84	3.70
PTA 62 limbs	Ingress before	83.33	62	46.35	5.88
	Ingress after	113.07	62	55.94	7.10
	Ingress rate before	3.01	62	4.15	0.52
	Ingress rate after	6.80	62	6.30	0.80
	SPY 10 before	25.96	62	20.37	2.58
	SPY 10 after	53.96	62	44.45	5.64
	ABI before	0.65	26	0.21	0.42
	ABI after	0.85	26	0.20	0.40
	TP before	41.15	33	22.39	3.89
	TP After	49.54	33	20.77	3.61

ORIGINAL SCIENTIFIC REPORT

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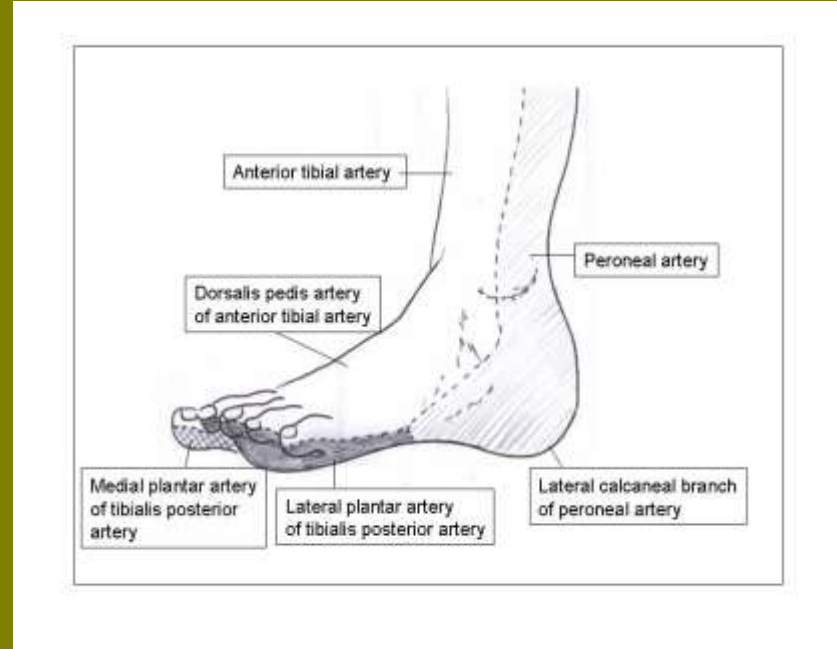
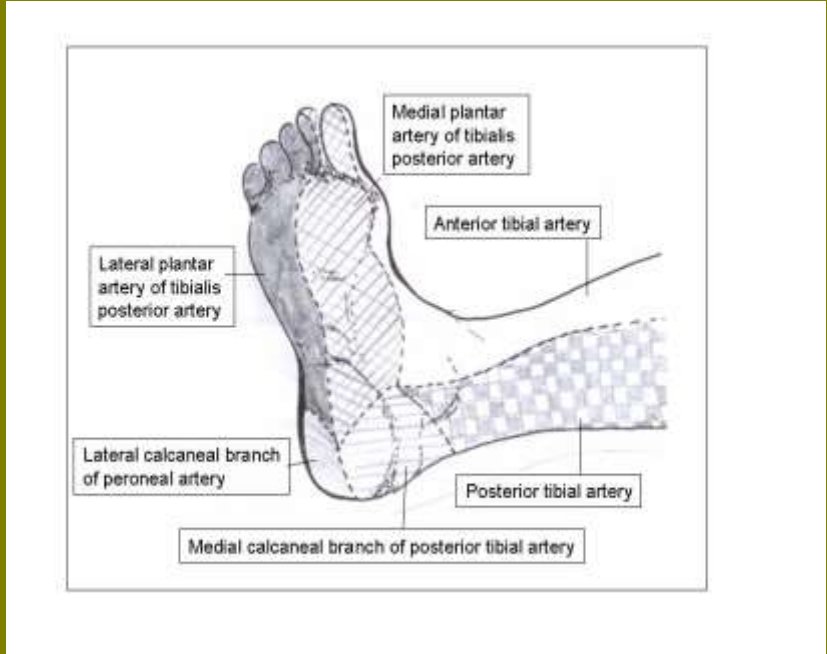
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PTA 62 limbs	Ingress before	83.33			8
	Ingress after	113.07			0
	Ingress rate before	3.01			2
	Ingress rate after	6.80	62	6.30	0.80
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59 IU

30 IU

P<0.001

The foot can be divided into five angiosomes originating from the three main crural arteries



ANGIOSOME CONCEPT:

It is beneficial in terms of wound healing and leg salvage to revascularize the crural vessel leading to an angiosome where the tissue lesion exist

Evaluation of ALL FOOT ANGIOSOMES with ICG-FI before and after infrapopliteal endovascular and surgical revascularization



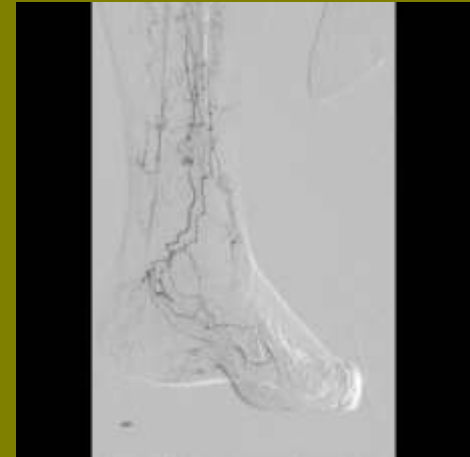
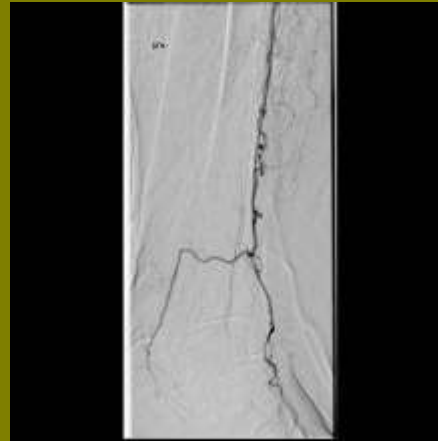
74 PATIENTS, 288 ANGIOSOMES, 46 EVT, 24 BYPASS

ICG-FI changes were analyzed in three groups:

1. Angiosomes that were revascularized DIRECTLY (targeted)

2. Angiosomes that were revascularized THROUGH GOOD COLLATERALS (indirectly targeted)

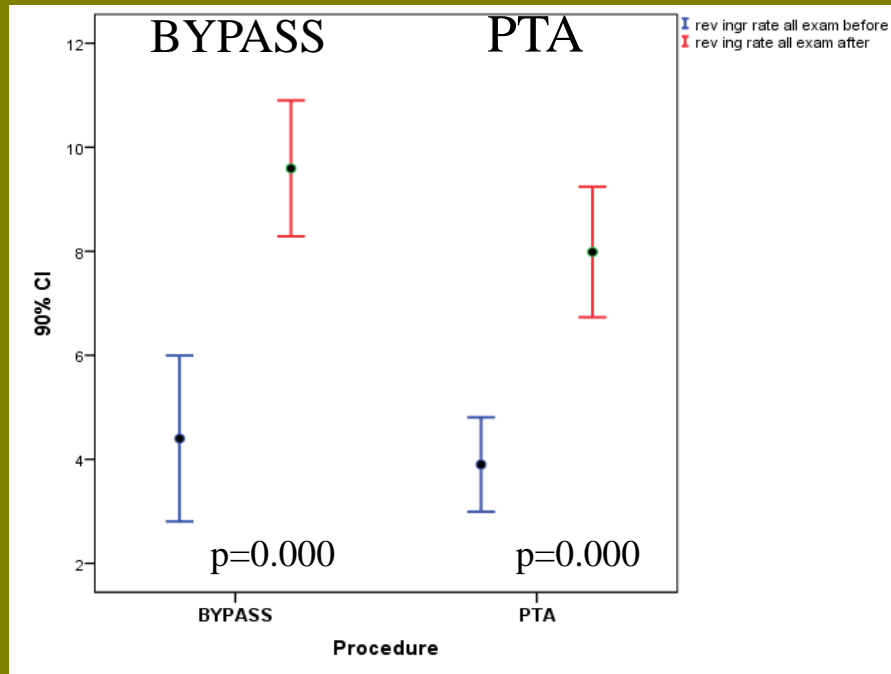
3. Angiosomes that were NOT REVASCULARIZED DIRECTLY NOR THROUGH STRONG COLLATERALS (nontargeted)



DIRECTLY REVASCULARIZED ANGIOSOMES

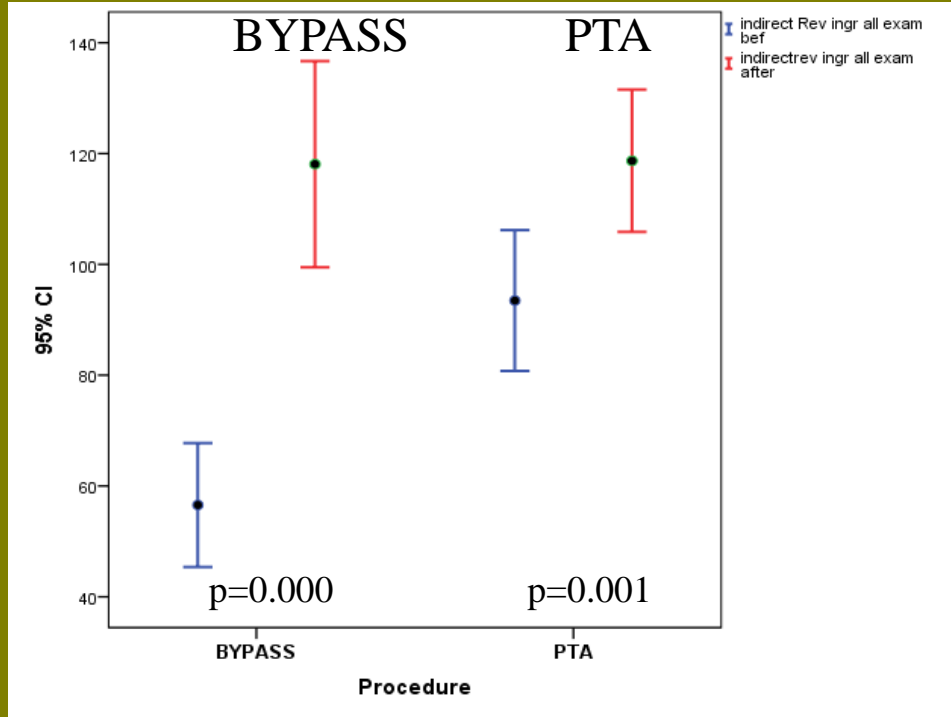
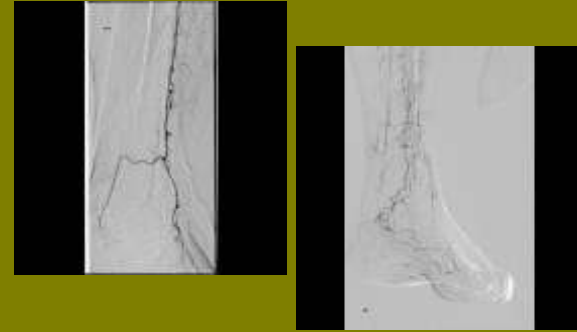
Bypass: increase 56 au

Pta: increase 39 au



In the angiosomes that were revascularized Directly, perfusion increased significantly after both bypass and pta and the increase was higher after bypass

Angiosomes that were REVASCULARIZED THROUGH COLLATERALS = indirectly revascularized

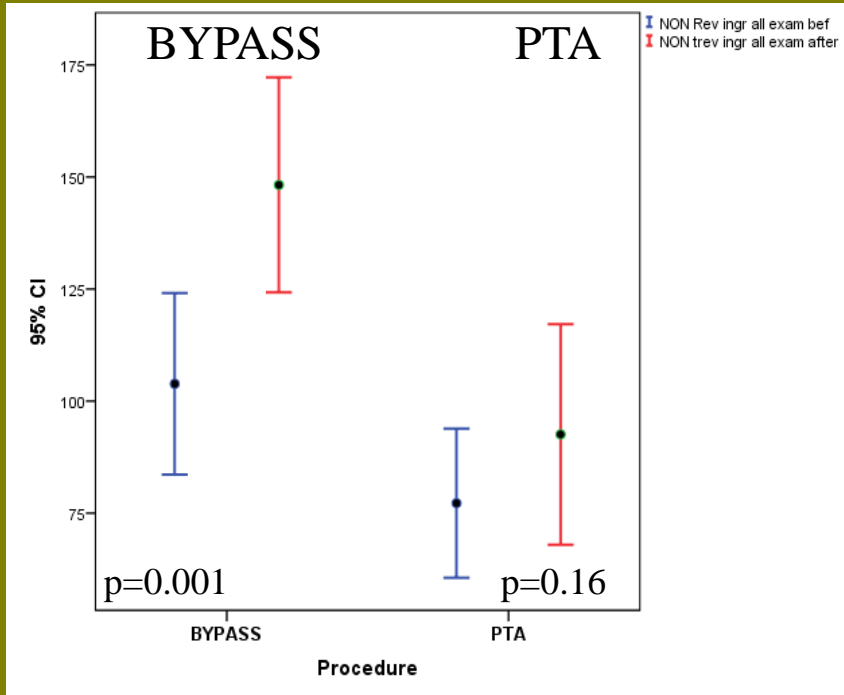


Bypass: increase 61 au
Pta: increase 25 au

In the angiosomes that were revascularized Through collaterals, the increase was also significant, and again the increase was lower after pta than after bypass

NOT DIRECTLY REVASCULARIZED, NO COLLATERALS

=non targeted angiosomes



Bypass: increase 44 au
Pta: increase 15 au

In the angiosomes that were not directly revascularized and there were poor collaterals, the increase in perfusion was significant after bypass, but not significant after pta

We have different feet with CLTI

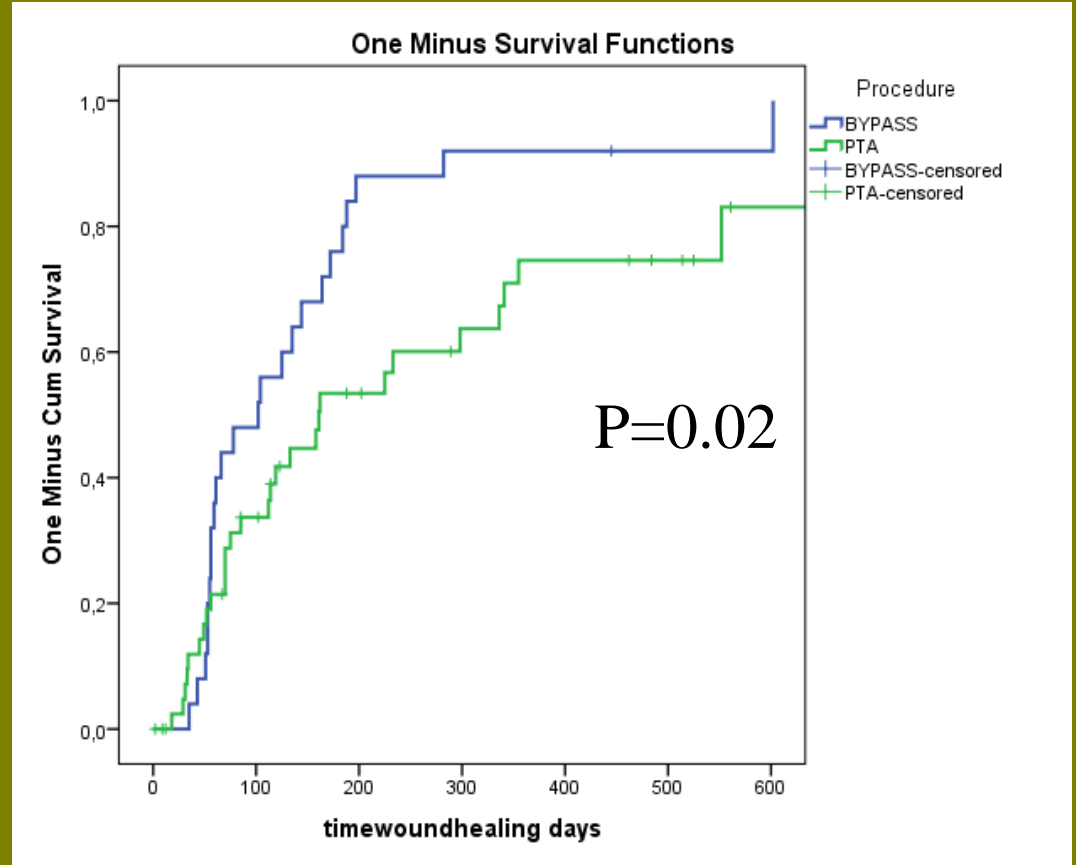
How we know what is enough
to achieve wound healing?



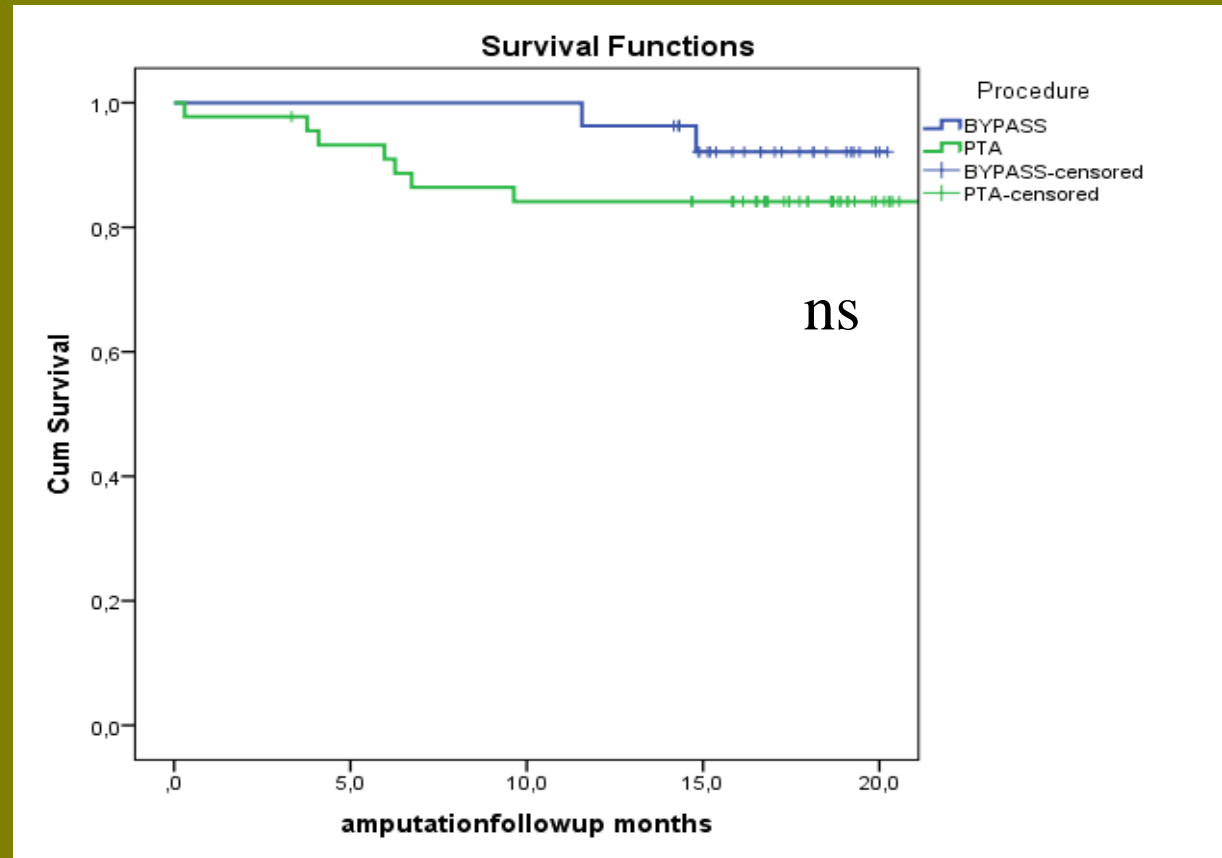
Wound healed in 56 (75.7%) patients

OUTCOME of 74 PATIENTS

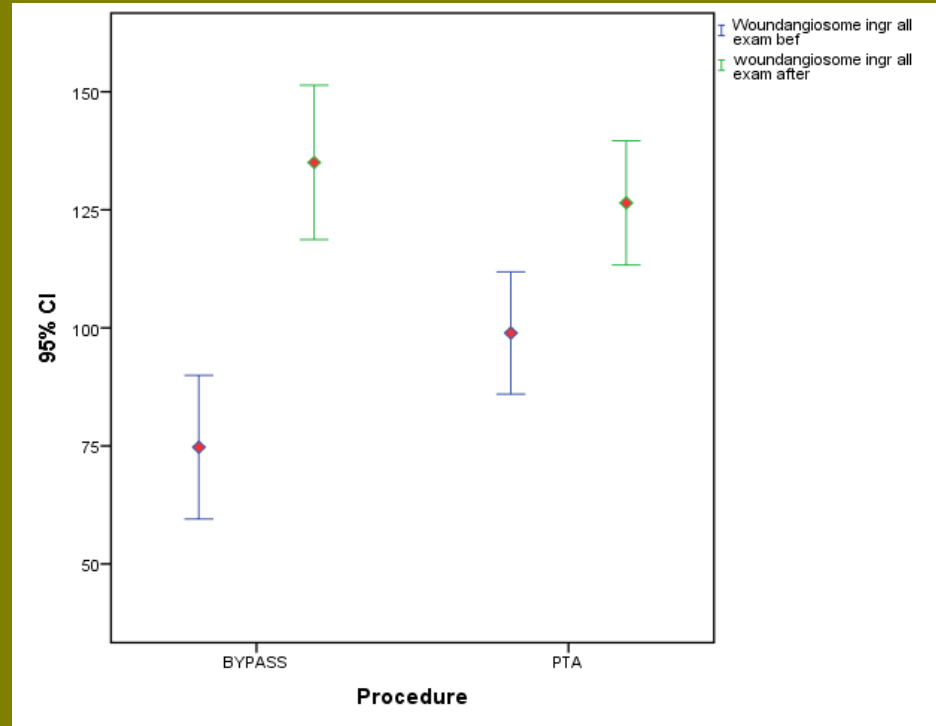
Mean FU 16.3±4.8 month (median 16.8, IQR 15-19 mo)



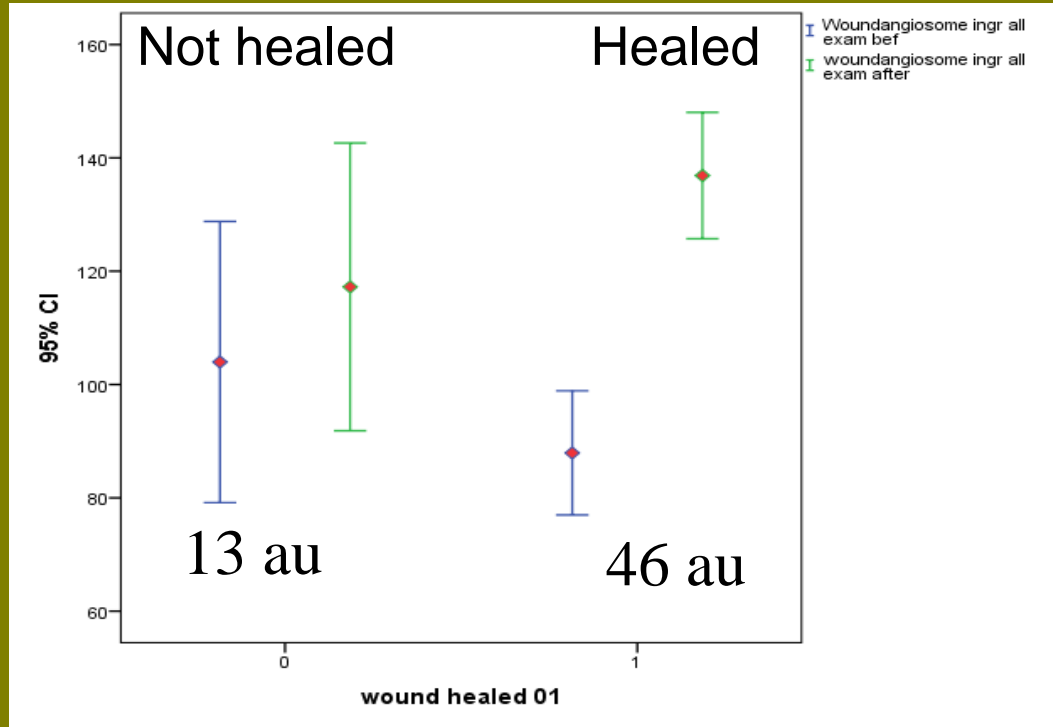
9 (12.2%) patients had amputation



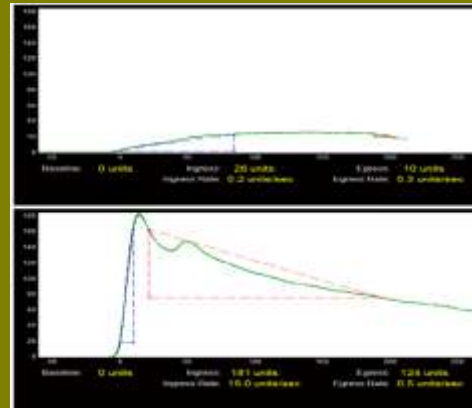
Increase in perfusion in the angiosome where the wound existed



Increase of perfusion in the angiosomes where the wound did not heal during the fu
Was only 13 units compared to 46 units in the angiosomes where the wound healed.



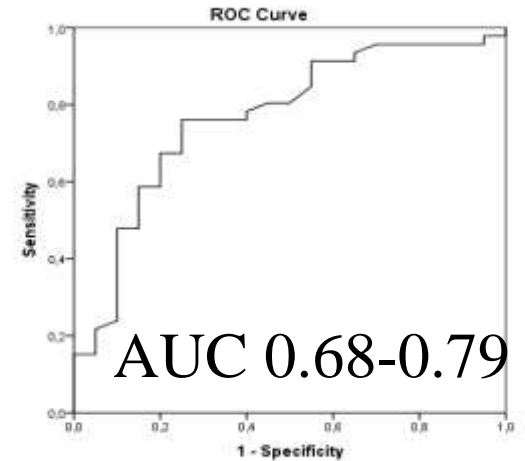
- Change in maximum intensity



19 AU increase predicted overall wound healing

30 AU increase predicted wound healing in 6 months

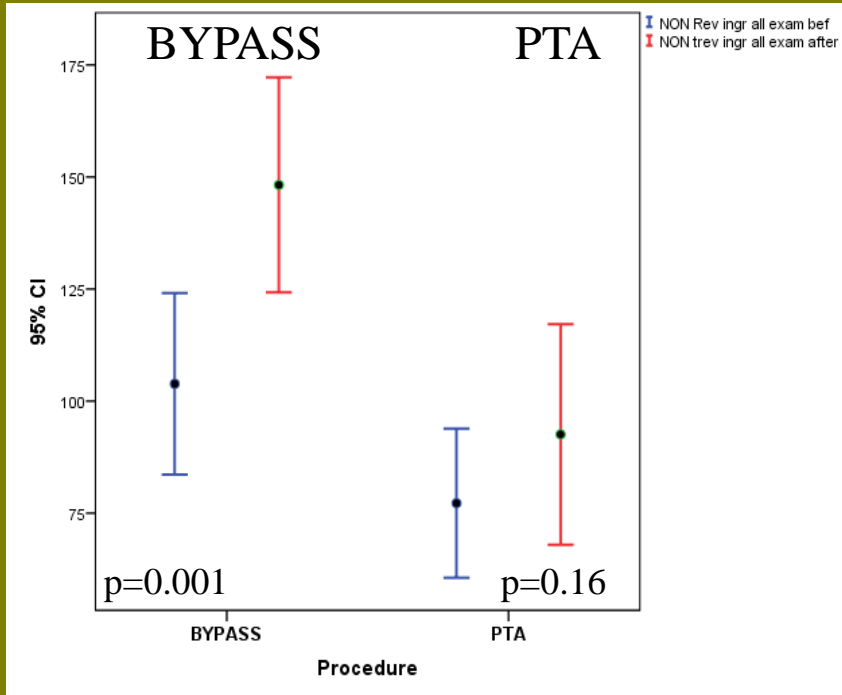
35 AU increase predicted wound healing in 4 months



NOT DIRECTLY REVASCULARIZED, NO COLLATERALS

=non targeted angiosomes

Bypass: increase 44 au
Pta: increase 15 au

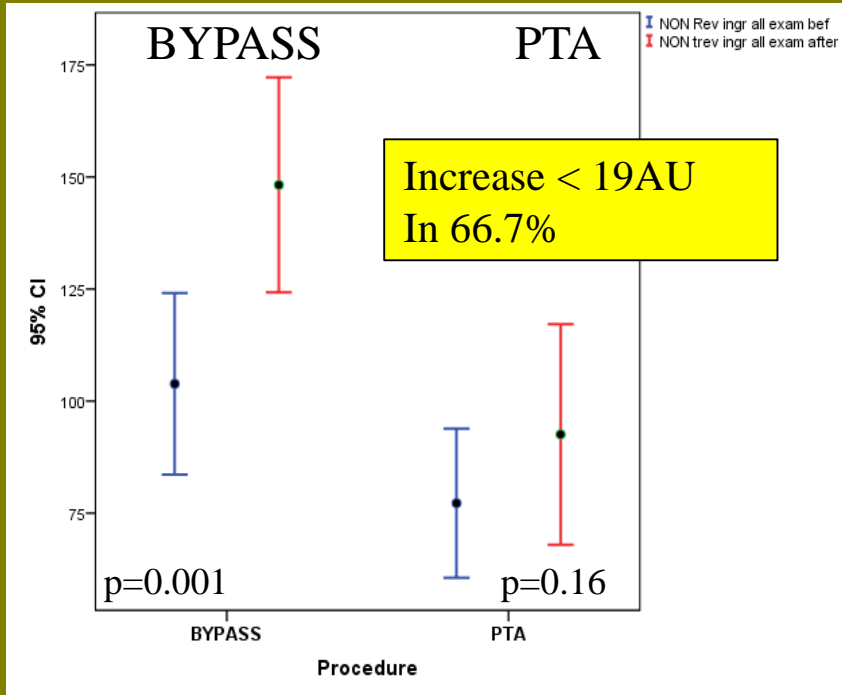


In the angiosomes that were not directly revascularized and there were poor collaterals, the increase in perfusion after pta 15 units

NOT DIRECTLY REVASCULARIZED, NO COLLATERALS

=non targeted angiosomes

Bypass: increase 44 au
Pta: increase 15 au



In the angiosomes that were not directly revascularized and there were poor collaterals, the increase in perfusion after pta 15 units

What are the factors associated with poor leg salvage after revascularization

- Diabetes
- ESRD
- Large wound/Rutherford classification
- Dementia
- Infection
- Poor patency
- Insufficient revascularization
- Delay



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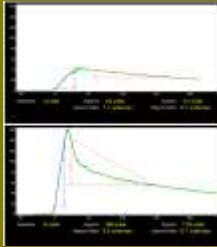


Related to non-angiosome targeted endovascular revascularization

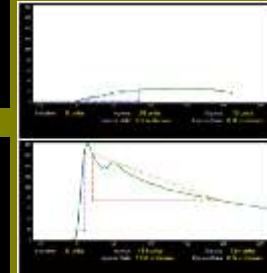


Before and after bypass to distal ATP

BEFORE

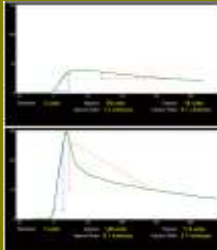


Change 39-148
Rate 1.4-8.1



Change 26-181
Rate 0.2-15

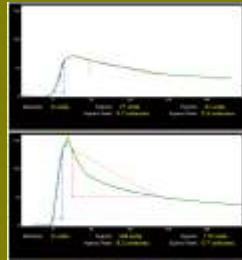
AFTER



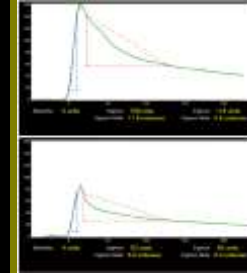
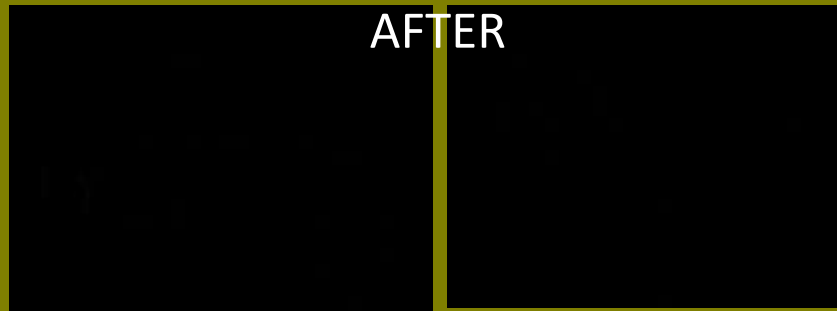
Change 43-159
Rate 1.1-8.9

CONCLUSION I: Open bypass increase perfusion more than endovascular treatments. If there is no excellent collaterals, targeted bypass leads to quicker wound healing than non targeted bypass.

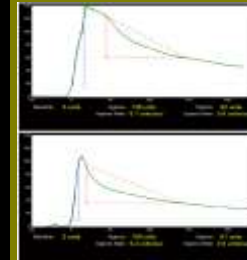
Before and after ATA recanalization



Change
71-149



Change
159-82



Change
138-106

CONCLUSION II: Nontargeted endovascular revascularization is not recommended unless there are clear collaterals to the wound angiosome from the treated artery. If not significant after endovascular revascularization, do not wait for a miracle! Do **BYPASS** or a new endovascular revascularization. **Always, be aware of DELAY!**