Perfusion Angiography (From Philips Health Care) To Assess The Functionality Of Sympathetic Activity with Foot Perfusion: It Is A Strong Predictor For Early Amputation In Ischemic Diabetic Foot Disease

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Disclosers
• No financial disclosers

Perfusion angiography with Philips 2D perfusion software
• Area Inflow arteries: < 10%
• Area Microcirculation: > 80%
• Area Venous outflow: < 10%

Total tissue perfusion

Peripheral resistance
Capillaries
Flow in the microcirculation has to be constant and low.

Autoregulation

Sympathetic nervous system in the foot.

Flow in the microcirculation has to be constant and low.

In patients with peripheral diabetic polyneuropathy, 20%-30% also has non-functioning sympathetic nervous system (sympathectolysis)
Dysfunctionality of the sympathetic nervous system has a strong association with amputation.


**Functional sympathetic nervous system.**
- Blocking the alpha receptors
- Decrease in peripheral resistance
- **Increase** in tissue flow

**Non-functional sympathetic nervous system.**
- Blocking the alpha receptors
- No decrease in peripheral resistance
- No **Increase** in tissue flow

**Perfusion Angiography:**

<table>
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<tr>
<th>T=Tolazoline (Alpha blocker)</th>
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<tr>
<td>Pre T</td>
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<td>Non-functional sympathetic nerve</td>
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<th>Study: Testing the functionality of the sympathetic nervous system in the foot with perfusion angiography</th>
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<tr>
<td><strong>Renal Insufficiency or Dialysis (%)</strong></td>
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<td>None (n)</td>
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<tr>
<td>Renal + (n)</td>
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<tr>
<td>Mortality (days)</td>
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<td>Diabetes type 1 (n)</td>
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<td>Diabetes type 2 (n)</td>
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<td>All patients had non-healing neuropathic ischemic ulcer. All patients on insulin All patients had polyneuropathy</td>
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Kaplan-Meier curves for amputation-free survival at 12 months (log rank $p < 0.001$; HR 14.22 95%CI: 3.64-55.51).

A: patients with functional sympathetic nervous system (N=20)
B: patients with dysfunctional sympathetic nervous system (N=11)

Kaplan-Meier curves of amputation-free survival in patients who did undergo angioplasty and in patients who did not undergo angioplasty (log rank $p = 0.407$; HR 0.65 95%CI: 0.22-1.94).

23 patients did undergo angioplasty.
8 patients did not undergo angioplasty.

Conclusion

• Testing the sympathetic nervous system of the foot with perfusion angiography has a very high predictive value for early amputation in diabetic patients with a neuropathic-ischaemic ulcer and polyneuropathy.

Clinical implication: If there is no ulcer healing after successful revascularisation in a patient with non-functional sympathetic nervous system a second re-intervention is probably useless.