Shock wave treatment reduces neuronal degeneration upon spinal cord ischemia and improves symptoms in a first-in-man trial


University Clinic of Cardiac Surgery
Innsbruck Medical University, Austria
thoraco-abdominal aneurysm
spinal cord ischemia

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Shenar SA, Svensson L.G. J Cardiothorac Vasc Anesth 1993
spinal cord ischemia

No causal treatment option!
spinal cord ischemia

Mechanisms of Injury

Primary Injury
1 - Loss of Neurons/Axons
2 - Demyelination

Secondary Injury
1 - Loss of Neurons/Axons
2 - Demyelination
3 - Inflammation
4 - Reactive Oxidative Damage and the Astrocytic Glial Scar
5 - Cyst Formation

Activated Astrocytes
Infiltrating Lymphocytes
Activated Macrophages
Phagocytic Macrophages
Neurons
secondary injury in spinal cord ischemia

Liu et al., J Neurosci 1997
Crowe et al., Nature Med 1997
secondary injury in spinal cord ischemia

Liu et al., J Neurosci 1997
Crowe et al., Nature Med 1997

* site of injury
no TUNEL+ cells

TUNEL+ neurons (large dots)
TUNEL+ glial cells (small dots)

TUNEL+ glial cells
outside lesion area (small dots)

scar

window of opportunity

Liu et al., J Neurosci 1997
Crowe et al., Nature Med 1997

www.carelab.at
secondary injury in spinal cord ischemia

Kakinohana et al., Stroke 2011
Toll-like receptor 3 signalling mediates angiogenic response upon shock wave treatment of ischaemic muscle

Hypothesis:

SWT → TLR3 activation → limitation of secondary damage
SWT for ischemic spinal cord

Lobenwein and Tepeköylü et al., JAHA 2016
SWT improves motor function and survival

Lobenwein and Tepeköylü et al., JAHA 2016

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SWT reduces neuronal degeneration

Lobenwein and Tepeköylü et al., JAHA 2016
improved neuronal survival in human spinal cords

Lobenwein and Tepeköylü et al., JAHA 2016
• SWT improves functional outcome and survival in a murine model of spinal cord ischemia

• SWT reduces secondary injury by stimulation of survival pathways

• SWT improves symptoms in patients with spinal cord ischemia

promising therapy for patients with spinal cord ischemia
team

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