



Year: 2022

Treatment of end-stage peripheral artery disease by neuromodulation

Cucuruz, B ; Kopp, R ; Hampe-Hecht, H ; Andercou, O ; Schierling, W ; Pfister, K ; Koller, M ; Noppeney, T

Abstract: Background: Neuromodulation is a therapeutic option to improve limb salvage in end-stage peripheral arterial disease (PAD), but there is no consensus on its indication for spinal cord stimulation (SCS) in PAD patients. Objective: The aim of this study was to present the outcome of end-stage PAD patients treated with SCS. Methods: This study is a retrospective analysis based on a local prospective registry. Neuromodulation was performed if there was: 1) no revascularisation option, 2) no septicemia, 3) and Rutherford stage 4-6. The primary endpoint of the study was limb salvage. Secondary endpoints were reduction in pain or simply pain reduction pain (assessed using a visual analog scale/VAS) and improvement in walking distance. Results: Limb salvage was reached in 30/34 patients (88%). Patients reported a significant reduction in pain on the 10-point VAS scale from baseline (median = 7.5, IQR = 7-8) to follow-up at 2 years (median = 0, IQR 0-2.75), $p < 0.001$. Walking distance also improved from preoperative (median = 50 m, IQR = 20-50 m) to follow-up at 2 years (median = 150 m, IQR 50-272 m), $p < 0.001$. Results: SCS implantation in patients with end-stage PAD can enable limb salvage in a high percentage of cases and increase mobility due to pain reduction. The role of microcirculation in these improvements needs to be investigated in further studies. Keywords: Neuromodulation; chronic critical limb ischemia; end-stage peripheral artery disease; spinal cord stimulation.

DOI: <https://doi.org/10.3233/ch-221436>

Posted at the Zurich Open Repository and Archive, University of Zurich

ZORA URL: <https://doi.org/10.5167/uzh-228102>

Journal Article

Accepted Version

Originally published at:

Cucuruz, B; Kopp, R; Hampe-Hecht, H; Andercou, O; Schierling, W; Pfister, K; Koller, M; Noppeney, T (2022). Treatment of end-stage peripheral artery disease by neuromodulation. *Clinical Hemorheology and Microcirculation*, 81(4):315-324.

DOI: <https://doi.org/10.3233/ch-221436>

Treatment of end-stage peripheral artery disease by Neuromodulation

B. Cucuruz^{a,b,e,*}, R. Kopp^c, H. Hampe-Hecht^b, O. Andercou^d, W. Schierling^e, K. Pfister^e, M. Koller^f and T. Noppeney^b

^aUniversity Hospital Halle, Department of Radiology, Halle, Germany

^bMartha Maria Hospital Nuremberg, Department of Vascular Surgery, Nuremberg, Germany

^cUniversity Hospital Zürich, Department of Vascular Surgery, Zürich, Switzerland

^dUniversity Hospital Cluj, Department of Surgery, Cluj, Romania

^eUniversity Hospital Regensburg, Department of Vascular Surgery, Regensburg, Germany

^fUniversity Hospital Regensburg, Center for Clinical Studies, Regensburg, Germany

Abstract.

BACKGROUND: Neuromodulation is a therapeutic option to improve limb salvage in end-stage peripheral arterial disease (PAD), but there is no consensus on indication for spinal cord stimulation (SCS) in PAD patients.

OBJECTIVE: The aim of this study was to present end-stage PAD patient outcomes treated with SCS.

METHODS: This study is a retrospective analysis based on a local prospective registry. Neuromodulation was performed there was: [1] no revascularisation option, [2] no septicaemia, [3] Rutherford stage 4–6. The primary endpoint of the study was limb salvage. Secondary endpoints were improvement in pain symptoms (assessed using a visual analog scale/VAS) and improvement in walking distance.

RESULTS: Limb salvage was reached in 30/34 patients (88%). Patients reported a significant reduction in pain on the 10-point VAS scale from baseline (median = 7.5, IQR = 7–8) to follow-up at 2 years (median = 0, IQR 0–2.75), $p < 0.001$. Walking distance also improved from preoperative (median = 50 m, IQR = 20–50 m) to follow-up at 2 years (median = 150 m, IQR 50–272 m), $p < 0.001$.

CONCLUSIONS: SCS implantation in patients with end-stage PAD can enable limb salvage in a high percentage of cases and increase mobility due to pain reduction. The role of microcirculation in these improvements needs to be investigated in further studies.

Keywords: Neuromodulation, spinal cord stimulation, end-stage peripheral artery disease, chronic critical limb ischemia

1. Introduction

Peripheral arterial disease (PAD) is a common manifestation of atherosclerosis and is associated with an increased risk of coronary artery disease and cardiovascular death [1–3]. In addition, critical limb ischemia (CLI) is a major problem in these patients. Despite improvements in vascular surgery, especially in endovascular techniques, the rate of major amputations in end-stage PAD is still high due to critical limb ischemia (CLI) associated with impaired wound healing and pain.

End-stage PAD is characterized by rest pain, ulcers, or gangrene in one or both lower limbs due to pre-existing peripheral arterial occlusive disease, in most cases worsened by diabetes. Up to 66% of patients with diabetes who are unsuitable for revascularization will require major amputation within

*Corresponding author: Cucuruz Beatrix, Department of Radiology, University Hospital Halle, Ernst-Grube-Straße 40, 06120 Halle (Saale), Germany. Tel.: +49 345 557 2441; Fax: +49 345 557 2157; E-mail: Beatrix.cucuruz@uk-halle.de.