Wearable laser Doppler flowmetry for the analysis of microcirculatory changes during intravenous infusion in patients with diabetes mellitus

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Introduction

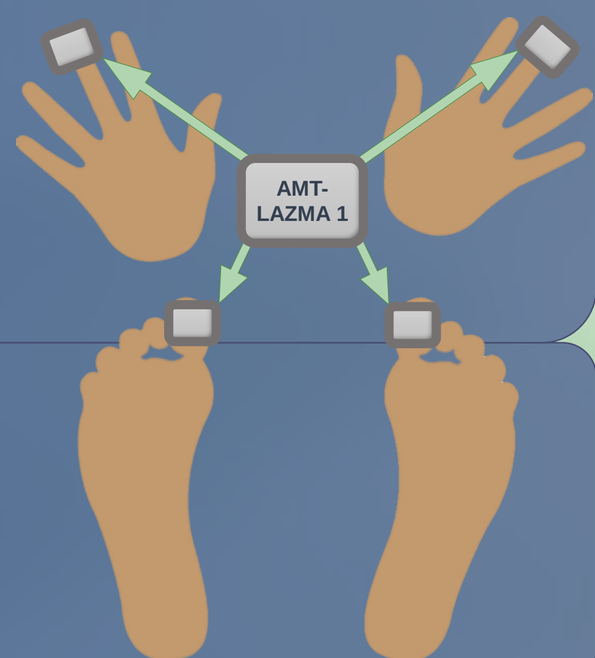
Diabetic polyneuropathy is one of the common complications of diabetes mellitus (DM) and a leading cause of non-traumatic limb amputation.

The **aim** of this study was to evaluate the change in blood microcirculation parameters during intravenous infusions of a solution of alpha-lipoic acid (ALA) in patients with type 2 DM using a system of wearable laser Doppler monitors.

Materials and methods

Experimental studies were carried out using four wearable LDF monitors "AMT-LAZMA 1" for the analysis of blood microcirculation.

The study involved 10 patients with type 2 DM (4 men and 6 women, average age 55.8±14.3)



2nd day of staying in the hospital (1st infusion day)
- **10** min of basal recording before **1st** infusion
- **20** min of recording during **1st** infusion
- **10** min of basal recording after **1st** infusion

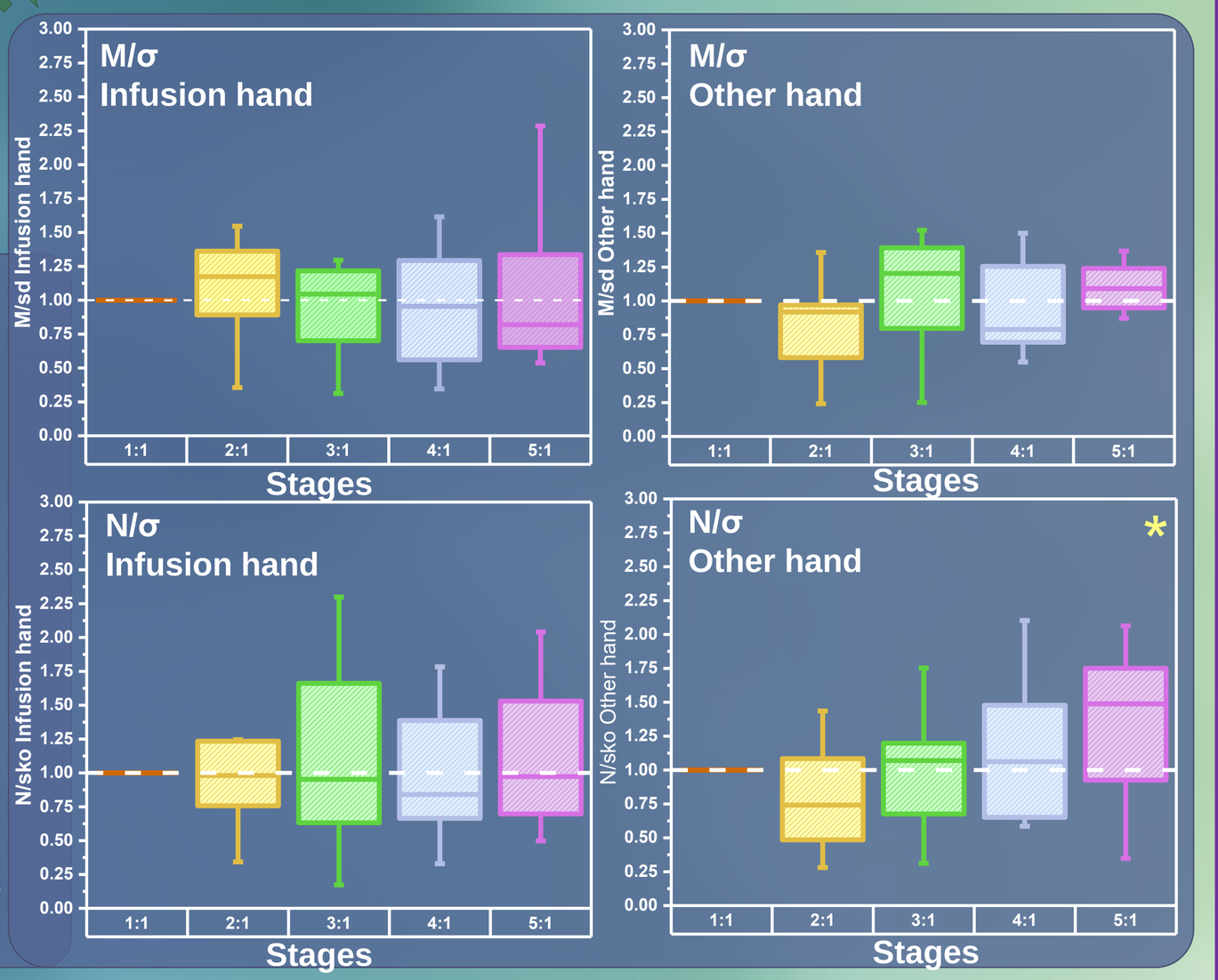
6 day of staying in the hospital (1st no infusion day)
- **10** min of basal recording

3rd day of staying in the hospital (2nd infusion day)
- **10** min of basal recording before **2nd** infusion

Results

- The index of microcirculation showed a tendency to decrease by the time the therapy is completed.
- In myogenic oscillations (**M/σ**) , different changes were observed in the upper and lower extremities.
- By the last stage, an increase in normalized oscillations in the hands is observed, while in the legs this parameter is decreased.
- During the treatment process significant changes in neurogenic fluctuations (**N/σ**) are observed for the upper and lower extremities.

* -statistically significant difference ($p<0,05$ according to the Friedman ANOVA test)



Conclusion

- LDF method can be used to assess changes in hemodynamic parameters in the treatment of diabetes complications.
- Wearable LDF devices are capable of the estimating of the microcirculatory parameters during intravenous infusions and tracing the dynamic changes in parameters during treatment.
- The use of ALA contributes to a change in the regulation parameters of microcirculatory blood flow, in particular, fluctuations of the neurogenic and myogenic origin.
- The research technique can be applied not only to ALA infusions but also to study another potential treatment option.

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Diabetic neuropathy, skin blood flow, alpha lipoic acid, laser Doppler flowmetry, wearable electronics