



External Muscle Stimulation to Influence Adjustment of Diabetes: a New Therapy Option for Type 2 Diabetics

Bettina Rose¹, Mark Lankisch¹, Christian Herder¹, Karin Röhrig¹, Svenja Labrenz¹, Judith Haensler², Lutz Heinemann², Stephan Martin¹

¹ Institute for Clinical Diabetology, German Diabetes-Center at the Heinrich-Heine-University Duesseldorf
² Profil Dept. of Research of the Metabolism, Neuss

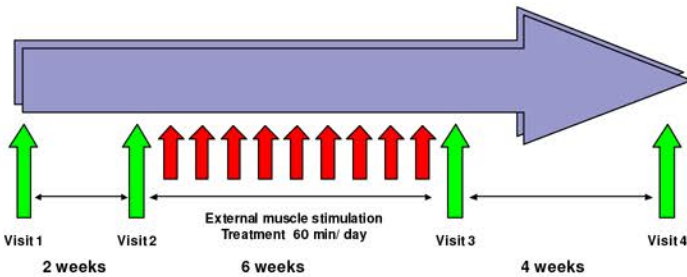
BACKGROUND AND AIMS

By the help of physical training insulin sensitivity and the adjustment of metabolism with diabetics can be improved. By means of other studies it was additionally shown that physical training will finally lead to a reduction of immunity parameters like Interleucin-6 (IL-6). It was the aim of this study to find out whether a six week treatment with a high frequent muscle stimulation (EMS) with patients suffering from Type 2 diabetes (T2D), will additionally improve metabolic and immunological parameters.

METHODOLOGY

During this 12-week study 16 patients with T2D and oral anti diabetical medication were included. After a two week Run-In phase without treatment, patients were given an EMS-device (HiToP 191, gbo Medizintechnik AG, Rimbach/Germany) for a daily treatment within the area of thigh and shank for the following 6 weeks. In the beginning as well as in the end of the treatment phase, blood was taken from the subjects and examined for metabolic and immunological parameters (TNF- α , IL-6, IL-18, Adiponektin) by means of highly intensive ELISA.

Study design



picture 1 study design

age (years)	57 ± 11
gender (f/m)	4/12
weight (kg)	107 ± 15
BMI (kg/m ²)	34.5 ± 5.2
waists (cm)	116 ± 16
circumference of waist (cm)	116 ± 9
HbA1c (%)	7.4 ± 1.1
blood sugar fasting (mg/dl)	159 ± 37
period with diabetes (years)	6.8 ± 4.8

Fig. 1 clinical characteristics of the study population



Fig. 2 EMS-device in operation

RESULTS

Improvement of the Adjustment of the Metabolism

During the treatment phase, a significant improvement of the weight, BMI and the HbA1c value in comparison to the run-in phase (Fig. 2) was noticed whereas the fasting blood sugar level, c-pepid level and the circumference of the waist remained largely unchanged.

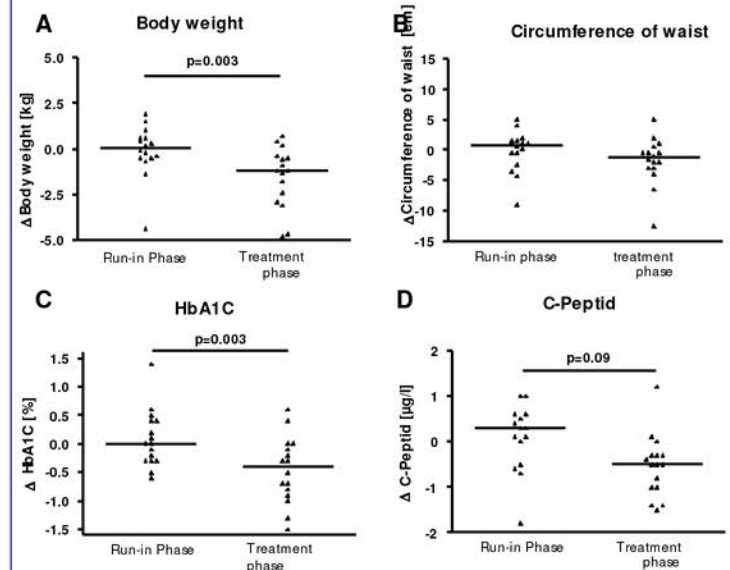


Fig. 2 Shown are the changes in body weight (A), circumference of waist (B), HbA1c (C) and the C-Peptide level during the Run-in and the treatment phase. Each point represents an individual, the line marks the median. The analysis was carried out with the Wilcoxon matched pairs Test.

Influence of an EMS-treatment on systemic immun parameters

With 12 of the 16 patients (75%) the HbA1c decreased during the treatment phase. Within this sub group a tendency of changes in the systemical immun parameters IL-6 and IL-18 was observed (Fig. 3).

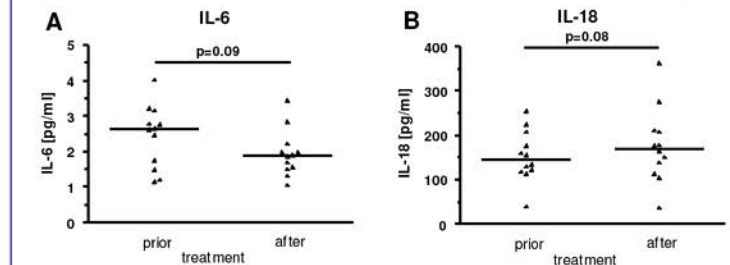


Fig. 3 Shown are the serum levels of the Zytokine IL-6 (A) and IL-18 (B) prior and after treatment with EMS within the sub group of the HbA1c-responders. Each point represents an individual, the line marks the median. The analysis was carried out with the Wilcoxon matched pairs test.

CONCLUSION

A short term treatment with a high frequent external muscle stimulation (EMS) has a positive influence on the body weight and can improve the adjustment of the blood sugar. Possibly, also the subclinical inflammation with patients with T2D is being influenced. These results point out that EMS is an additional option for the treatment of type 2 diabetics.

	Treatment		
	prior	after	p-Wert
IL-6 (pg/ml)	2.4 ± 0.9	2.0 ± 0.7	0.09
IL-18 (pg/ml)	153 ± 57	177 ± 84	0.08
MCP-1 (pg/ml)	174 ± 66	182 ± 56	0.57
RANTES (ng/ml)	28.6 ± 16.4	33.0 ± 25.0	0.73
IP-10 (pg/ml)	334 ± 202	342 ± 158	0.79
Adiponektin (ng/ml)	6.124 ± 5.375	6.513 ± 6.418	0.68
hsCRP (mg/l)	3.2 ± 2.2	2.4 ± 2.2	0.15
Leukozyt (/μl)	6.419 ± 1.249	6.375 ± 1.599	0.79

Tab. 2 Serum level of the immun parameters prior and after the treatment with EMS in the group of HbA1c-responders. The analysis was carried out with the Wilcoxon matched pairs test.