BIBLIOGRAPHY

5. Da Ros et al. EASD Copenhagen 2006;
8. Piaggesi et al. DFSG 2008
9. Veneziano et al. WUWHS Toronto 2008
10. Evangelisti et al. GNB Congress 2008
FREMS™: a biophysical treatment in peripheral complications in diabetic patients.

**FREMS™: Scientific Rationale**

FREMS™ is a “biocompatible” electrical neurostimulation of recent generation. Thanks to its physical characteristics it enhances vasomotion thus peripheral blood flow, it induces the modulation of angiogenetic growth factors (VEGF) and functional recovery of peripheral nervous system. The clinical outcome is a significant pain control, tissue regeneration and functional recovery of the treated area. Several clinical studies has demonstrated the actions mechanisms and benefit effects of FREMS™.

**FREMS™: Technical Rationale**

FREMS™ consists in series of biphasic, asymmetric, electrically balanced pulses. It is characterized by a “multiparametric modulation” of frequency, pulse duration and amplitude of the provided electrical signal.

**FREMS™ is a biophysical treatment dedicated to NEURO-VASCULAR REHABILITATION of legs complications and chronic wounds**

**FREMS™: Action Mechanisms**

- Growth factors release (VEGF)

- Enhancement of vasomotion activity thus peripheral blood flow increase
  - “Recovery of 0.1 Hz microvascular skin blood flow in disautonomic diabetic (type 2) neuropathy by using FREMS”. L. Bocchi et al. [submitted](10)


**Specific and different FREMS™ sequences have been investigated in**

- **PAINFUL DIABETIC NEUROPATHY**
  - “Effectiveness of frequency-modulated electromagnetic neural stimulation in the treatments of painful diabetic neuropathy”. Bosi et al. 2005 Diabetologia
  - **CONCLUSIONS:**
    - FREMS is a safe and effective therapy for neuropathic pain in patients with diabetes and is able to modify some parameters of peripheral nerve function (increase in sensory tactile perception and motor nerve conduction velocity).
    - Clinical benefits persisted at the 4-month follow-up.
    - No significant side effects were recorded during the study

- **PERIPHERAL ARTERIAL DISEASES**
  - “Neuromodulation FREMS in the treatment of diabetic peripheral arterial disease (PAD)”. Da Ros et al. EASD 2006
  - **CONCLUSIONS:**
    - In diabetic patients with PAD, FREMS seems to achieve considerable effects on:
      - Improvement of oxymetric values at 3 months follow-up;
      - Improvement of pain free walking distance at 3 months follow up;
      - In patients with no indications of revascularization FREMS can lead to amelioration without risks

- **LEG/FOOT DIABETIC ULCERS**
  - **CONCLUSIONS:**
    - FREMS significantly facilitates epithelialisation of ulcus cruris and significantly decreases pain level, especially in the first 36-48h without damaging effects.
    - It has cumulative effects which is evidenced 2 months after treatment.

- **WOUND HEALING**
  - **CONCLUSIONS:**
    - FREMS accelerate wound healing and reduce pain associated both to ulcers and to diabetic neuropathy. Follow-up at 30 and 45 days.

- **DNOAP – CHARCOT’S NEURO-ARTHROPATHY**
  - “Effectiveness of frequency modulated electromagnetic neural stimulation (FREMS) in the treatment of the acute phase of Charcot's neuro-arthropathy (DNOAP)”. Piaggesi et al. DFGS 2008
  - **CONCLUSIONS:**
    - This short-term pilot study showed encouraging results for the application of FREMS in the acute phase of DNOAP, associated to immobilization and weight relief.

- **Non-Healing ulcers: Domiciliary assistance including electrical neurostimulation. Clinical outcome and costs reduction. Veneziano et al.**
  - **CONCLUSIONS:**
    - FREMS may be a valid tool for the healing of complex chronic wounds
    - Reduction of area and specialty of depth were significant after few weeks of starting FREMS therapy;
    - Pain control was as well significant with elimination of this important component of chronic wounds;
    - Effectiveness in healing (time of assistance - 58%) and in costs (direct management cost - 31%);
    - FREMS treatment allowed the improvement of quality of assistance and quality of life of patients.