

# **EFFICACY OF ELECTRICAL MUSCLE STIMULATION IN CLINICAL PRACTICE**

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# Disclosures

Nothing to disclose

# Relevance

The thromboembolic complications occur in 1-2% of all hospitalized patients, cause more than 10% of all deaths, are the leading cause of death in hospitalized trauma patients.

# **The generally accepted methods of prevention of thromboembolic complications**

Drug prevention

Compression knitwear

Early activation of the patient

Intermittent pneumocompression

Passive movements

## HOWEVER!

None of these methods does not use the most important mechanism in ensuring normal physiological conditions, the outflow of venous blood – **the work of the muscular-venous pump of the shin .**

# Methods for the prevention of thromboembolic complications in trauma patients under external fixator or skeletal traction?

Drug prevention - **yes!**

Compression knitwear ??

Early activation of the patient ??

Intermittent pneumocompression ??

Passive movement ??

# Relevance

Despite all prevention methods over the past decade in the world rate of deep vein thrombosis increased by **3.1** times, the incidence of pulmonary embolism increased by **2.5** times

# Electropulse Myostimulation



The most effective way of stimulating muscle pump and prevention of venous stasis

Kaplan R.E. et al., *Thromb Haemost* 2002 Aug; 88(2):200-4  
Griffin M. et al., *Eur J Vasc Endovasc Surg* 2010 Dec;40(6):766-71  
Czyrny J.J. et al., *Vascular* 2010 Jan-Feb; 18(1):20-7



# Electropulse Myostimulation

## **"Training walk" in the conditions of immobilization of the limb:**

- **the elimination of edema and lymphedema,**
- **improvement of venous outflow**
- **the increase in arterial inflow,**
- **improvement of microcirculation,**
- **the increase of circulating blood volume in the limb,**
- **prevention of thromboembolic complications**

# Own research

60 patients 40 to 85 years

Long operational manual ( $4.0 \pm 1.2$  hours)

The high risk of thromboembolic complications

(2012)	EMS group (n=30)	Control group (n=30)
Deep vein thrombosis of the shin without signs of pulmonary embolism	<b>1</b> <b>(3,3%)</b>	<b>10</b> <b>(33,3%)</b>
Thromboembolism of pulmonary artery branches	<b>0</b>	<b>2 (6,7%)</b>
	p=0,008	

# PURPOSE OF THE STUDY

Evaluate the effectiveness of indirect electro myostimulation (EMS) in the prevention of thromboembolic events (TE) and reduction of terms of treatment and rehabilitation of patients with fractures of the shin bones (FSB).

# MATERIALS AND METHODS

## A prospective randomized controlled trial

60 patients with closed fractures of the tibia  
(segment 4 on the classification of AO/ASIF)

Timing of the injury –  
0.5 to 3.0 hours



# MATERIALS AND METHODS

## **The treatment algorithm of all patients:**

1. Stabilization of the fracture - external fixator or skeletal traction
2. Assigning low molecular weight heparins
3. After the relief of edema - the final reduction and fixation (intramedullary or extramedullary) under the control of image intensifier

# MATERIALS AND METHODS

## **Research Group**

**30** patients

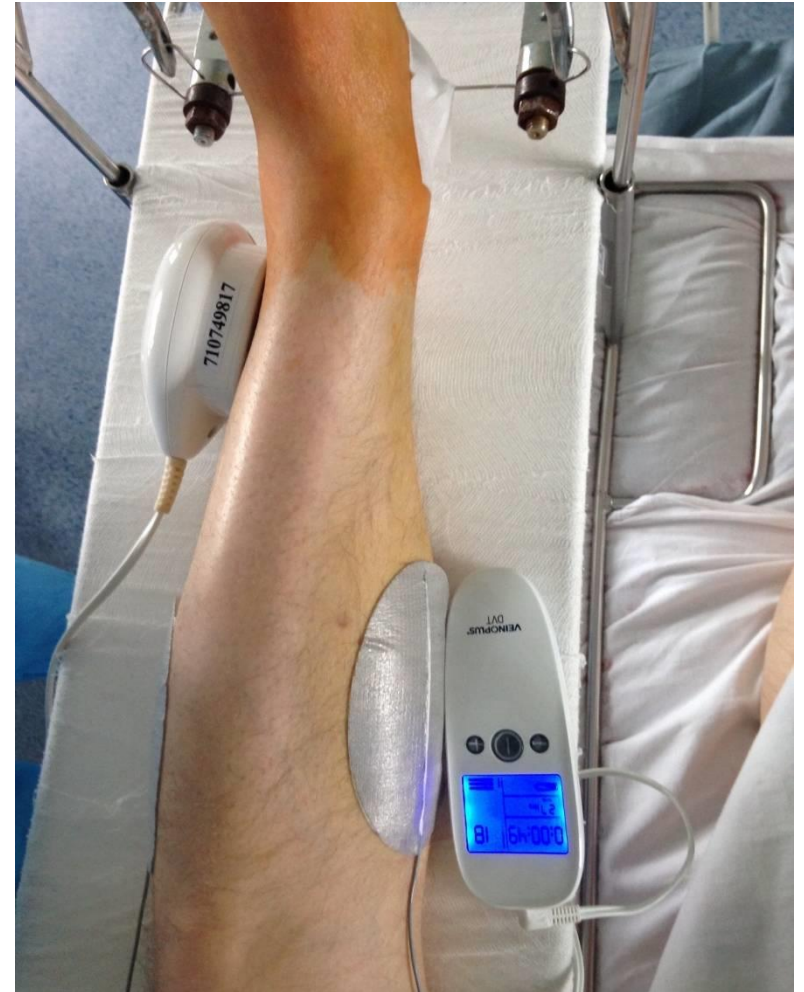
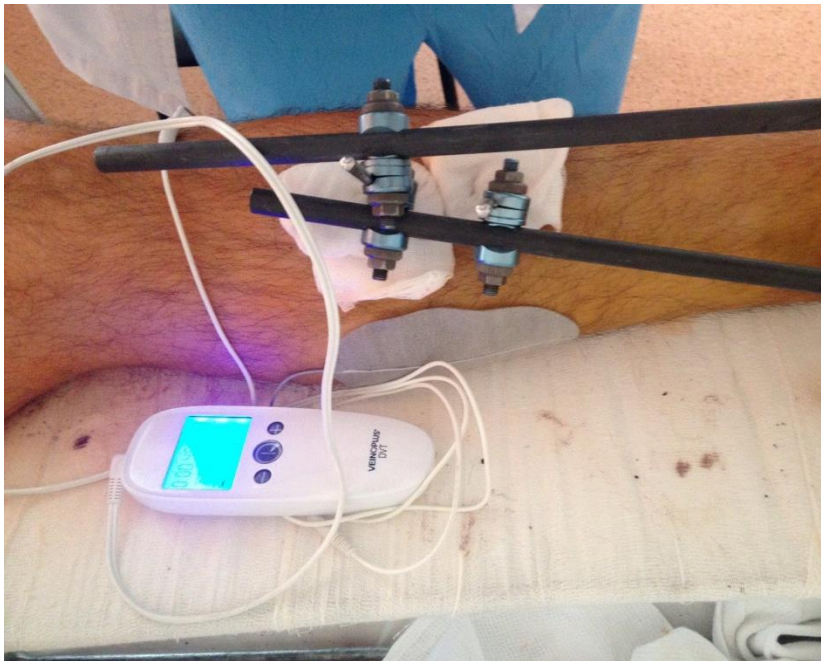
(18 men, 12 women; mean age  $42.4 \pm 1.5$  years) - 2 sessions EMS, 3 hours daily from the first day

## **Control group**

**30** patients

(17 males, 13 females; mean age  $44.0 \pm 2.2$  years)

# MATERIALS AND METHODS



# RESULTS

	EMS group n=30	Control group n=30	p
The period of relief of the edema, days	5,1 ± 0,5	8,2 ± 0,7	< 0,05
The period until the final osteosynthesis, days	7,3 ± 0,7	10,4 ± 0,9	< 0,01
The duration of hospitalization, days	16,6 ± 1,0	17,7 ± 1,3	0,02
The frequency of thromboembolic complications	0	2 (14,3%)	< 0,001



# RESULTS

	EMS group n=30	Control group n=30	p
The increase in the index of the SF-36 to the 5th day after the final osteosynthesis	24,9%	14,5%	< 0,05
The increase range of motion (flexion) after the final osteosynthesis	71,9%	16,7%	< 0,01
The increased range of motion (extension) after the final osteosynthesis	194,1%	10,2%	< 0,002

# CONCLUSIONS

Application of the methodology EMS managed to avoid thromboembolic complications, improve the quality of life of the patients during hospital stay, reduce the period of treatment and rehabilitation.

# DISCUSSION

The use of this technology allows to quickly arrest the peripheral edema and thereby reduce the time of the final osteosynthesis.

The muscle training in conditions of immobilization of the limb does not allow to develop the atrophy and thereby shortens the rehabilitation period.

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## Study Personnel:

**Surgeons** - V.N. Obolenskiy<sup>1,2</sup>, K.V. Lobastov<sup>2</sup>, L.A. Laberko<sup>2</sup>,  
P.S. Leval<sup>1</sup>

**Trauma surgeons** – A.V. Karpenko<sup>1,3</sup>, An.A. Semenisty<sup>1,4</sup>

**Nurses** – all nurses in surgery/trauma/orthopedic units<sup>1</sup>



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**Thank you for your attention !**

