

# **EFFECT OF PULSED GALVANIC ELECTRO STIMULATION AND ULTRASOUND ON BURN HEALING. A RANDOMIZED CLINICAL TRIALS**

***Hassane kheir Eddine: PT, MS, DPT***

***Jamal ktaiche: PT, MS***

***Ghada Radwan: PT, MBA***

Lebanese University, Beirut.

***Rami Abbas: PT, MS and PhD***

Assistant Professor, Beirut Arab University.

***Khodor Haidar Hassan: MD, PhD***

Lebanese University, Beirut.

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## **Abstract**

The goal of this study is to evaluate the effect of pulsed galvanic electro stimulation of high voltage and ultrasound on the healing of induced burn applied on rats.

48 rats (Sprague Dawley), mass between 300g and 400g, age between 3 months and 4 months. These rats are putted and the same experimental conditions of alimentation and hygiene. Rats are divided into 3 groups of 16 rats each. Each rat was induced to a uniform burn of second degree by a specific device fabricated specially to this study.

Group ES undergoes a treatment of electro stimulation by a pulsed galvanic current of high voltage for 10 min daily during 2 weeks.

Group US undergoes a treatment of pulsed ultrasound of 1w/cm<sup>2</sup> for 2 minutes daily during 2 weeks

Group control GC undergoes placebo treatment.

Measure are done by digital camera, results are analyzed by specific program (AutoCad) on computer.

Wound healing between the three groups are different and statistical tests ( T-tests and ANOVA) done between the two groups US and GC show no significant difference in the reduction of the surface of healing between them ( $\alpha > 0.05$ ), whereas the comparison between ES group and the two others group was significant ( $\alpha < 0.05$ ).

At the end of the second week of treatment, the best healing was presented in ES group where the wound was healed by 61.4 % whereas the groups GC and US were 11.9 % and 14.9 % respectively.

Therefore the ES group have the best results between than others groups (GC and US).

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**Keywords:** Skin healing, burn healing, galvanic electro stimulation, ultrasound,

### **Introduction**

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### **Methodology:**

Our study aims to compare the effect of pulsed galvanic current of high voltage and pulsed ultrasound in the acceleration of wound healing on induced burn on rats.

### **Hypothesis:**

There is no significant difference in the level of wound healing of induced burn between the 3 groups (ultrasound, electro stimulation and control group) during the first and the second week.

### **Population:**

48 rats (16males and 32 females) are selected randomly to this experiment, they have been selected from the lab of AUB (American Lebanese University) of same specie (Sprague Dawley). Their mass vary between 300g and 400g, age between 3 months and 4 months. These rats are putted and the same experimental conditions of alimentation and hygiene. Also the sequence of 12 hours in light and 12 hours in darkness was respected during the experiment.

The 48 Rats are divided into 3 groups of 16 rats each, randomly selected:

- Group ES: 16 rats undergoes a treatment by electrostimulation.
- Group US: 16 rats undergoes a treatment by ultrasound.
- Group CT: 16 rats control group.

**Tools:**



**Dynatron 850 plus**



**Sonopuls 590**



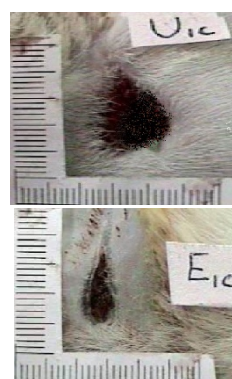
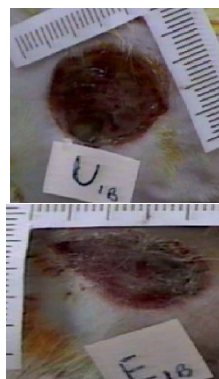
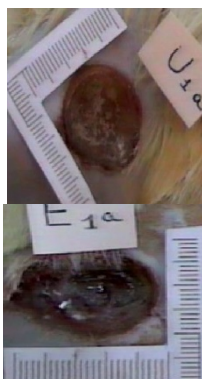
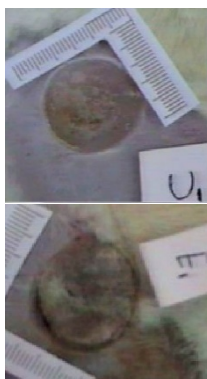
**Specific device constructed specially to induce burns**

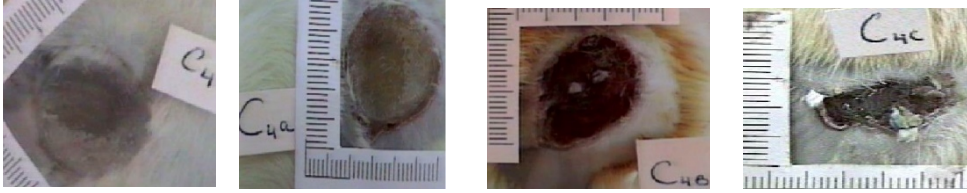
**Procedure of burn:**

- The 48 rats are anesthetized by Kitamine intra muscular by a Veterinarian, each dose respect to the mass of each rat.
- The lateral part of the hip is well shaved.
- Burn is produced perpendicularly. Temperature 95 degree, time 20 seconds producing a burn of second degree.

**Procedure of measure:**

- Photos are taken directly after burn, in day 1, day 8, day 14 and day 21, with a scale to calculate the surface.
- Surfaces are calculated by AUTOCAD.





Figures showing the difference between burns healing in the 3 groups during the 2 weeks.

**Procedure of treatment:**



**Treatment with electro stimulation**

**Treatment with ultra sound**

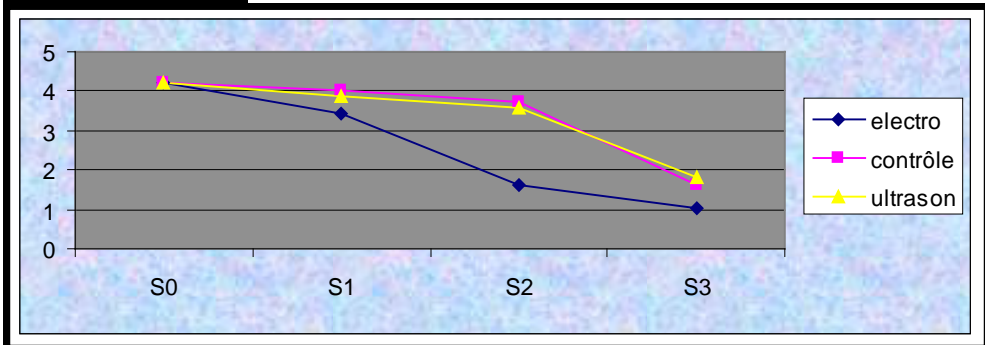
**Parameters:**

ES group: pulsed galvanic current, high voltage applied 10 min around the burn for 2 weeks.

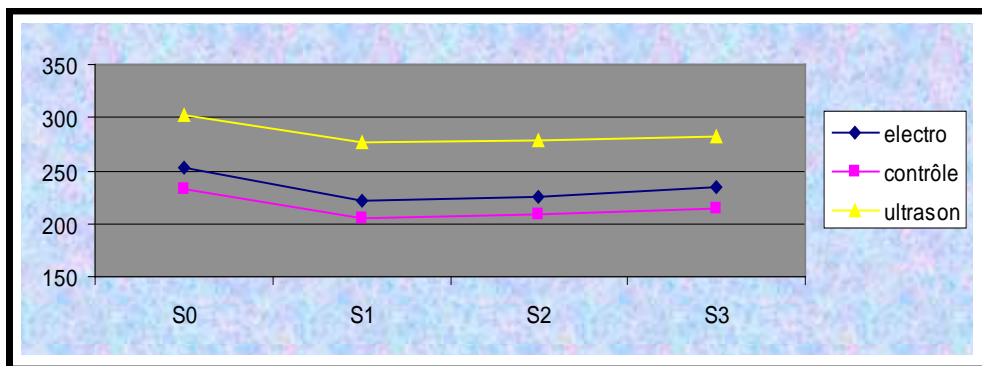
US group: 1 MHz, pulsed 20% , 2 ms , 100 Hz , 1 W/cm<sup>2</sup>, surface of the head 0.5 cm<sup>2</sup>.

There was no treatment applied during the third week.

**Statistical results:**



Variation of the mean of the surfaces (in cm<sup>2</sup>) between the 3 groups during the 3 weeks.



Variation of the mean of the mass (in g) between the 3 groups during the 3 weeks.

		Sum of squares	Df	f	P
ES	Between groups	9.332	2	17.203	0.000
	Within groups.	10.566	39		
US	Between groups	21.972	2	70.044	0.000
	Within groups.	7.058	45		
CT	Between groups	33.586	2	75.577	0.000
	Within groups.	9.555	43		

ANOVA between the surfaces of the 3 groups during the 3 weeks

### Discussion of the results

Group US did not represented any significant difference in the reduction of the surface of lesion in compare with the control group. The results may be caused by:

- High intensity (1W/Cm<sup>2</sup>).
- Application of the head around the lesion.
- Frequency 1 MHz.
- Short duration for 2 weeks only.
- Histological effect of ultra sound.

Group electro stimulation present a significant difference in the reduction of the surface of lesion in compare with control group.

- Best result was between week 1 and week 2 .
- Polarity of the wound was negative.
- Direct effect.

### Recommendation

- Trying to apply the treatment to patients suffering from burns by galvanic pulsed current at high voltage to reduce surface of lesion.
- Application of 10 minutes was sufficient.
- It is not recommended to use pulsed ultra sound with intensity 1 W/Cm<sup>2</sup> in the treatment of burn.

## Conclusion

The application of pulsed galvanic current of high voltage in the treatment of burn increase the healing process.

The application of pulsed ultra sound in the treatment of burn has no significant effect in the reduction of the surface of lesion.

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