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## Abstract

**Background:** Central pain caused by spinal cord or brain injury tends to be severe and refractory to despite aggressive treatment, such as in thalamic pain syndrome, neuromyelitis optica spectrum disorder (NMOSD) and other forms of transverse myelitis, and spinal cord gliomas.

**Methods:** We reviewed our experience with treatment of these relatively rare maladies with Scrambler Therapy, a noninvasive form of neuromodulation.

**Results:** One transverse myelitis patient got substantial relief lasting months (Mealy M, Int J MS Care. 2017), leading to the NMOSD trial. In a small, sham controlled randomized trial, NMOSD patient pain scores were reduced in the ST arm from 5 to 1.5 at 30 days,  $P < 0.01$ , while the sham treatment gave no relief. (Neurology, submitted) Of three patients with pain due to thalamic strokes, surgery and/or radiation, treatment gave over 50% relief long-term in 2 of 3 (D'Amato S, A A Pract. 2018). In the one spinal cord glioma patient, pain in her index finger was reduced from 8-10/10 to 1-2/10 and treatment is ongoing. All successfully treated patients reported marked relief of allodynia and hyperalgesia, in addition to pain relief as reported previously. (Marineo G, JPSM 2012)

**Conclusions:** Scrambler therapy is a promising treatment modality for patients with these individually rare but collectively common forms of central pain. It has allowed return to more normal function in most patients, with reductions in pain medication use. Pictures of electrode placement and treatment plans will be shown, allowing others to do this safe and often effective treatment.

## Objectives

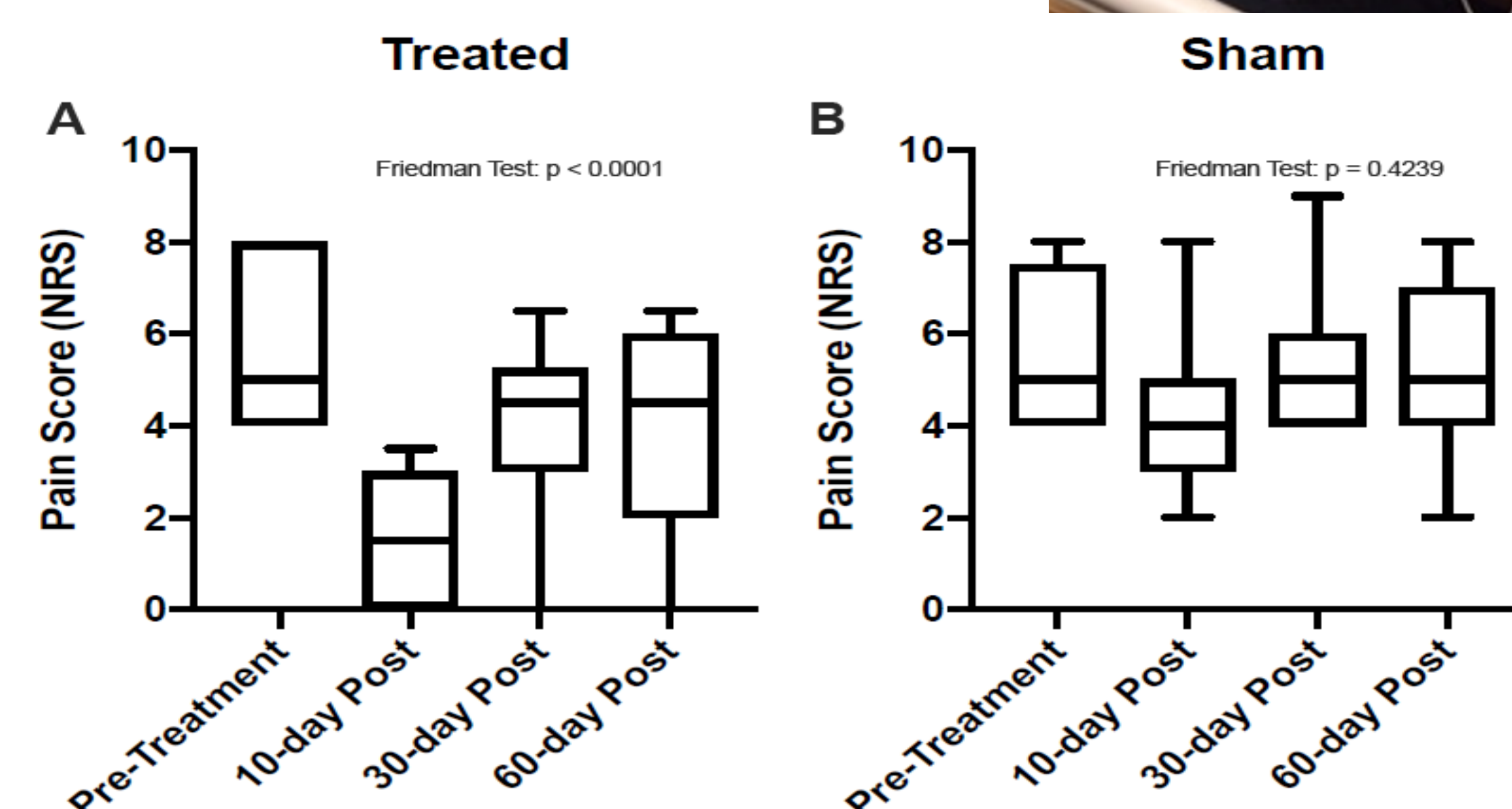
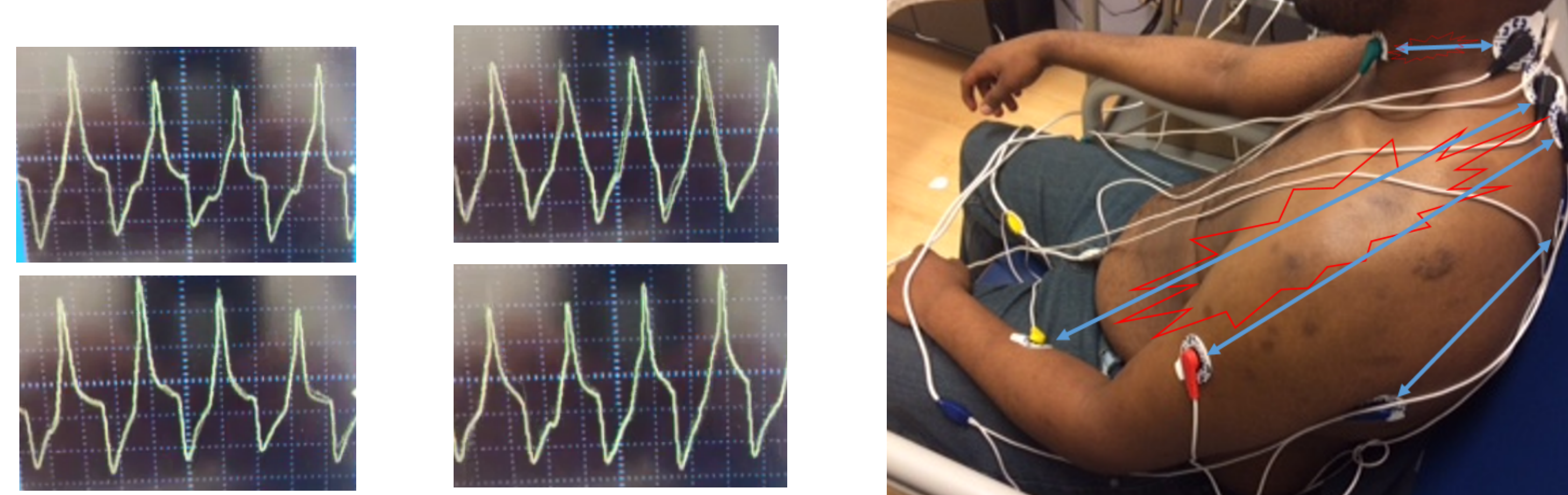
- Review treatment of central pain of spinal cord and brain origin with Scrambler Therapy.

## The Evidence

- NMOSD is a disease of younger people, women more than men. There is no effective pain treatment yet described. We did a randomized trial of 22 patients, 11 in each arm, who received 10 x 35 minute Scrambler Therapy Sessions or a sham treatment (mechanical buzzer on the skin).

## Evidence, continued

**NMOSD:** This 25 year old man had NMOSD pain in a cape distribution. Electrodes were placed in the affected dermatomes, distal to the pain, and proximal to catch the dorsal branch of the spinal accessory nerve. The Scrambler Therapy signal travels between each pair of electrodes and is identical in each pair. The signal is maximum 5.5 mA, maximum current density 0.0002009 W/cm<sup>2</sup>, with 16 different waveforms. These are randomly sequenced based on the ST algorithms, with random spaces and larger “snap” currents.

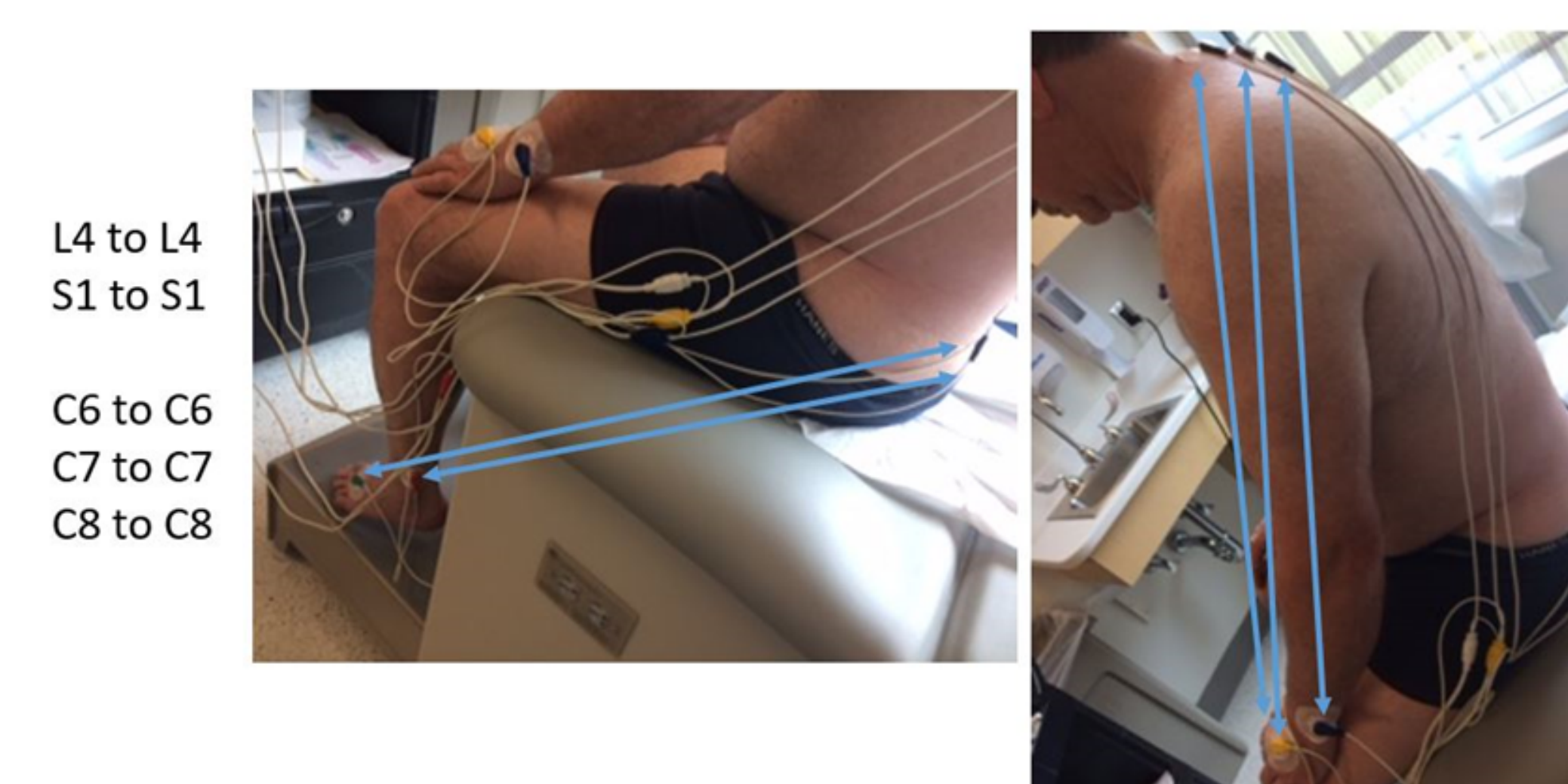


The difference between the Treated (5 → 1.5) and Sham (no change) groups was highly significant. 4/11 had their pain go to '0'. The next trials and current practice is to give “maintenance” or booster treatments monthly.

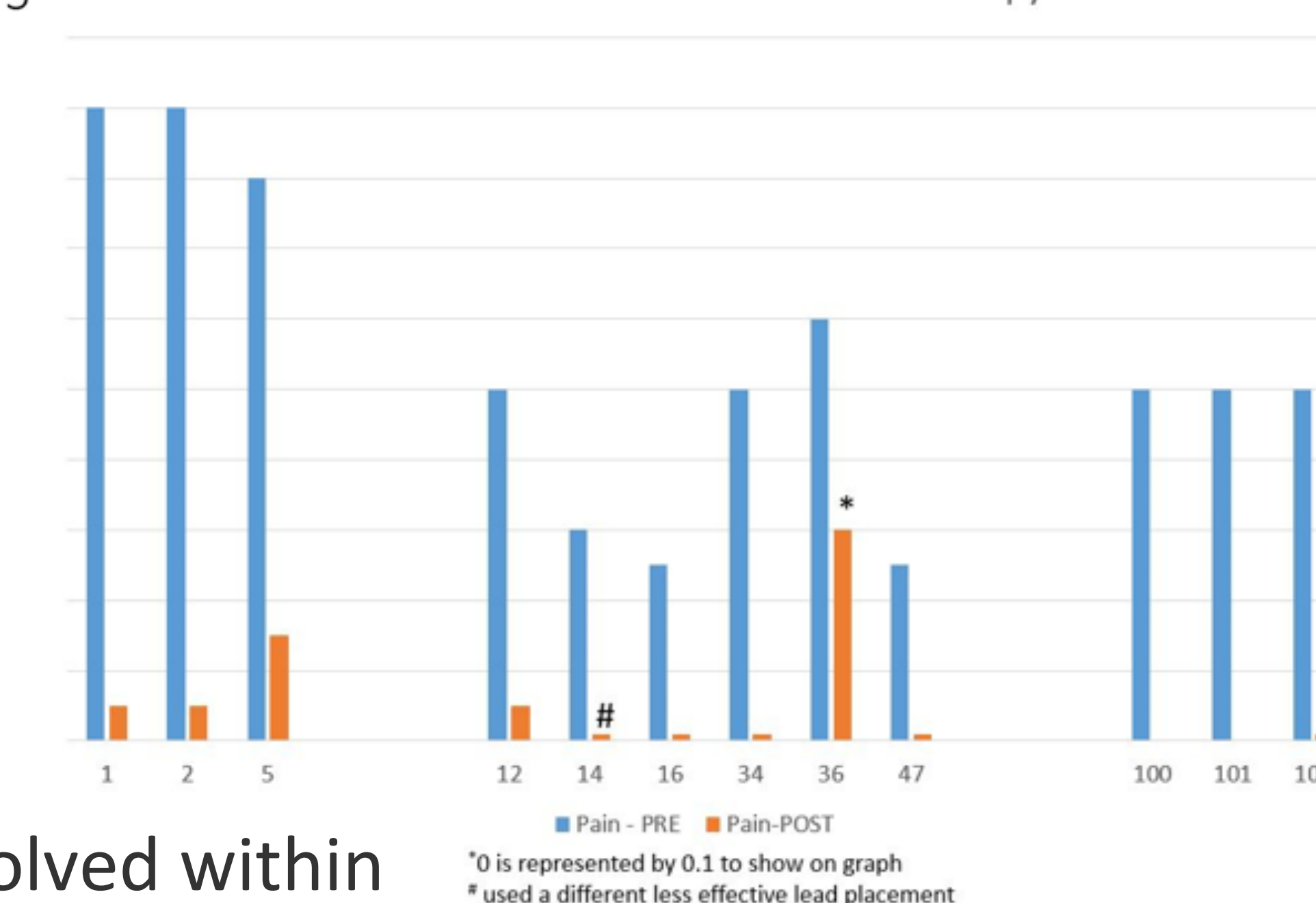
**Dejerrine-Roussy or central thalamic pain:** We have successfully treated a 52 year old woman and 56 year old man with prior thalamic strokes. The man had 6.5 years of excruciating neuropathic pain in the distal tips of all five left fingers, and the medial and lateral left foot.

## Evidence, continued

Lead placement to treat central pain in the medial-lateral foot, and fingers 1-5



Pain Scores Pre and Post Scrambler Therapy



After 6.5 years of constant pain, his allodynia resolved within 15 minutes, and his pain resolved to near 0 with the first treatment. Maintenance treatments, usually 1 to 3 at a time were sufficient to maintain his pain near 0. He is back at full activity.

A similar outcome was found with the 52 year old woman who had had unrelieved pain for 12 years.

## Conclusions

- Central spinal cord and brain pain syndromes are individually rare but collectively common.
- In each case so far, Scrambler Therapy has succeeded in reducing pain quickly and substantially with long lasting benefit.
- Maintenance therapy, started when the pain begins to reappear, is successful in quickly reducing the pain. Most times, just a few sessions are needed every several months.
- Further studies are underway to discern mechanism(s) of action and optimal treatments.

## References

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