DOI: 10.4274/csmedj.galenos.2025.2024-5-3

LETTERS TO THE EDITOR

Cam and Sakura Med J

CSMJ

GalvanoRegeneration: A New Term and a New Page in Regenerative Therapy with Percutaneous Needle Electrolysis

Bülent Alyanak[1], Fatih Bağcıer[2], Mustafa Turgut Yıldızgören[3], Burak Tayyip Dede[4]

[1]Gölcük Necati Çelik State Hospital, Clinic of Physical Medicine and Rehabilitation, Kocaeli, Turkey
[2]University of Health Sciences Turkey, Başakşehir Çam and Sakura City Hospital, Clinic of Physical Medicine and Rehabilitation, İstanbul, Turkey
[3]Konya City Hospital, Clinic of Physical Medicine and Rehabilitation, Konya, Turkey
[4]University of Health Sciences Turkey, Prof. Dr. Cemil Taşcıoğlu City Hospital, Clinic of Physical Medicine and Rehabilitation, İstanbul, Turkey

Keywords: Percutaneous needle electrolysis, regeneration, galvanic current, pain, musculoskeletal

Dear Editor,

Percutaneous needle electrolysis (PNE) is a treatment modality that uses an acupuncture needle to apply galvanic current to injured tissue, mechanically and electrically stimulating the tissue. PNE produces a non-thermal, electrolytic ablation that activates cellular systems involved in phagocytosis and soft tissue repair, thereby inducing a regulated inflammatory response (1). While PNE is not a technically new intervention the term "galvanoregeneration" is proposed here as a conceptual framework to re-define its regenerative impact with a modern perspective.

Both *in vivo* and *in vitro* studies have shown that cells move directionally in response to electric current. This response is known as electrotaxis or galvanotaxis (1). This cell migration is important in initiating the inflammatory response. Galvanic current application also affects cell adhesion, alignment, proliferation, differentiation, and apoptosis. Evidence suggests that the migration of inflammatory cells towards injured tissue can lead to morphological alterations and promote healing. Concurrently, vascular endothelial cells also exhibit responses to galvanotaxis, which is associated with an increase in angiogenesis (2).

Histological analysis has revealed that the application of galvanic current to injured tissues results in a reduction of pro-inflammatory cytokines, specifically tumor necrosis factor-α and interleukin-1β. Concurrently, there's an upregulation of anti-inflammatory proteins like PPAR-γ, alongside a marked upregulation of in vascular endothelial growth factor (VEGF) and its receptor VEGF-R1. Additionally, the activity of NF-κB, which is instrumental in phagocytosis and tendon regeneration, is notably suppressed. Collectively, these observations suggest that galvanic current, as administered through PNE therapy, plays a significant role in promoting the repair of tissues (2).

Corresponding Author: Bülent Alyanak MD, Gölcük Necati Çelik State Hospital, Clinic of Physical Medicine and Rehabilitation, Kocaeli, Turkey

E-mail: bulentalyanak@hotmail.com **ORCID ID:** orcid.org/0000-0003-4295-4286

Received: 29.05.2024 **Accepted:** 09.07.2025 **Epub:** 28.07.2025

Cite this article as: Alyanak B, Bağcıer F, Yıldızgören MT, Dede BT. GalvanoRegeneration: a new term and a new page in regenerative therapy with percutaneous needle electrolysis. Cam and Sakura Med J.

Galvanic current applied with PNE has also been shown to increase the expression of some genes associated with collagen regeneration and tissue remodeling in the extracellular matrix. Changes in the expression of COX-2, MMP-9, and VEGF are more pronounced than in other genes (3). Galvanic current enhances the proinflammatory M_1 phenotype of macrophages, activates the $NLRP_3$ inflammasome, does not induce inflammasome-mediated pyroptosis, increases *in vivo* inflammation, and induces a tissue regenerative response. Therefore, it has been reported that galvanic current is a viable technique for tendon regeneration and PNE is effective for the treatment of chronic lesions (4).

Several case studies have suggested that PNE is effective in the treatment of various musculoskeletal conditions. PNE has been found to have a significant effect on reducing musculoskeletal pain and improving pain-related disability in both the short and long term. However, it is considered safe in terms of its favorable application side effect profile of PNE. Ultrasound-guided application further enhances safety. Ultrasound-guided application of PNE not only enhances targeting accuracy but also ensures safety and reproducibility in clinical settings (5).

In conclusion, PNE appears to contribute positively to the healing of muscle and tendon injuries. PNE therapy is still in its infancy. It has a history of only 10 years. Nevertheless, based on these promising results, we believe that PNE will be a modern weapon for physicians in regenerative medicine. Therefore, we use the term "galvanoregeneration" to describe the treatment of PNE. It is important to increase scientists' awareness of PNE.

Footnotes

Authorship Contributions

Surgical and Medical Practices: B.A., F.B., M.T.Y., Concept: B.A., F.B., M.T.Y., B.T.D., Data Collection or Processing: B.A., F.B., M.T.Y., Analysis or Interpretation: B.A., F.B, M.T.Y., B.T.D., Literature Search: B.A., F.B., M.T.Y., B.T.D., Writing: B.A., F.B., M.T.Y.

Conflict of Interest: No conflict of interest was declared by the authors.

Financial Disclosure: The authors declared that this study received no financial support.

REFERENCES

1. Abat F, Valles SL, Gelber PE, et al. Mecanismos moleculares de reparación mediante la técnica Electrólisis Percutánea Intratisular en la tendinosis rotuliana [Molecular repair mechanisms using the intratissue percutaneous electrolysis technique in patellar tendonitis]. Rev Esp Cir Ortop Traumatol. 2014;58:201-205.
2. Valera-Garrido F, Margalef R, Bosque M, Minaya-Muñoz F, M. Santafé M. Percutaneous needle electrolysis accelerates functional muscle regeneration in mice. Appl Sci. 2022;12:10014.
3. Sánchez-Sánchez JL, Calderón-Díez L, Herrero-Turrión J, Méndez-Sánchez R, Arias-Buría JL, Fernández-de-Las-Peñas C. Changes in gene expression associated with collagen regeneration and remodeling of extracellular matrix after percutaneous electrolysis on collagenase-induced achilles tendinopathy in an experimental animal model: a pilot study. J Clin Med. 2020;9:3316.
4. Peñin-Franch A, García-Vidal JA, Martínez CM, et al. Galvanic current activates the NLRP3 inflammasome to promote type I collagen production in tendon. Elife. 2022;11:e73675.
5. Gómez-Chiguano GF, Navarro-Santana MJ, Cleland JA, et al. Effectiveness of ultrasound-guided percutaneous electrolysis for musculoskeletal pain: a systematic review and meta-analysis. Pain Med. 2021;22:1055-1071.