The Role of Extracorporeal Pulse Activation Therapy on Pain Reduction with Peroneus Longus Tendinitis

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Statement of Purpose:

Extracorporeal Pulse Activation Treatment (EPAT) is evidence-based, FDA-approved technology for use on musculoskeletal conditions. Literature primarily focuses on Achilles tendon and plantar fascia in foot and ankle pathology. The purpose of the study is to test the efficacy of EPAT as an adjunct modality in patients diagnosed with peroneus longus tendinitis with primary endpoint of pain relief.

Literature Review:

Extracorporeal Pulse Activation Therapy (EPAT) is widely known for its healing effect on a multitude of musculoskeletal conditions. There has been increasing evidence in regards to its safety and effectiveness when treating these conditions. Despite the success of treatment, the overall mechanism of action is still unknown. Theory suggests that there could be a variety of different mechanisms that contribute to healing from the physical nature of producing positive pressure to underlying tissue and activating signal transduction pathways and gene expression to the biological component of promoting chondroprotective effect, neovascularization, anti-inflammation, anti-apoptosis, and tissue regeneration[1]. Indications for the use of EPAT range from chronic tendinopathies when conservative treatment has failed to even as an alternative to surgery in patients with nonunions[1]. Various additional indications due to strong supporting evidence include calcifying shoulder tendinopathy, plantar fasciitis, and Achilles tendinopathy[1], of which some reflect structures within the foot and ankle.

One of the first studied structures in treatment with shockwave was plantar fasciitis dating back to 1996 with subsequent findings of significant improvement with heel pain, patient satisfaction, and overall success with extended follow up[2,6-8]. Since then, its application has reached different lower extremity conditions like diabetic wounds[3-5], avascular necrosis and fractures[9-11], and lower extremity tendinopathies[12-14]. Outcomes have shown significant wound reduction and time to healing, increased nonunion reduction in high-energy fractures along with success rate when treating these nonunions, and significant clinical and functional scores for tendinopathies like chronic Achilles tendinopathy [3-5,9-14]. However, although EPAT has shown effective results with various lower extremity conditions, there have been studies that have not shown efficacy of EPAT over other treatments for management[2]. These studies should not deter away from its use, but rather continue to drive its use as an option for treatment within lower extremity conditions.

With evidence indicating significant effects for lower extremity conditions, limited research has been shown in regard to its use on specific tendinopathies like peroneus longus tendinitis. Its efficacy as a treatment option with patients diagnosed with peroneus longus tendinitis is widely unknown.

Methodology:

- Search Strategy:
  - A retrospective chart review was conducted for patients diagnosed with peroneus longus tendinitis confirmed with ultrasound or MRI that received EPAT from one single outpatient facility from November 2016 through August 2020.
- Inclusion:
  - Patients ≥18 years of age
  - Peroneus longus tendinitis diagnosis (ICD-10 Codes M76.71, M76.72, M77.51, or M77.52)
  - Treated with EPAT confirmed with CPT codes 0101T or 0020T
  - 3 EPAT sessions or deemed without need for additional sessions
  - Patient followed up after last EPAT session or reported pain relief
- Exclusion:
  - EPAT utilized for a diagnosis other than peroneus longus tendinitis.
  - Inadequate follow up or incompletion of all treatment sessions deemed necessary
- EPAT Treatment Protocol
  - Electrical charge of 90 mJ at 12 Hz which was increased to 120 mJ for 10 minutes with a noninvasive probe focusing on the area of concern
- Primary Outcomes:
  - Pain reduction after initial treatment
  - Complete pain relief following treatment
- Secondary Outcomes:
  - Recurrence of pain/duration to recurrent pain
  - Demographic characteristics
  - Prior conservative treatment
  - Hypermobile forefoot leading to forefoot supinatus and dorsiflexed first metatarsal and hallux limitus

Figure 1. Locations of EPAT Administration.

Figure 2. Extracorporeal Pulse Activation Treatment.

Results:

11 patients (84%) received biomechanical treatment prior to undergoing EPAT. All patients experienced pain reduction after initial treatment at median time of 1 (1 – 1.5) week. Pain relief was achieved in 12 patients (92%) after a median time of 10.25 (2.65 – 13.25) weeks.

Demographics	Median	Lower Quartile	Upper Quartile
Age	58	38	65
Weight (lbs)	163	159	196
Follow Up (Mos)	30.25	12.50	37.50
Duration to Pain Reduction after Initial Treatment (Weeks)	1	1	1.5
Duration to Complete Pain Relief following Treatment (Weeks)	10.25	2.65	13.25

Figure 3. Table of Demographics of Subjects.

Biomechanical Treatment Prior to EPAT	Frequency	Percent (%)
Yes	11	84.62
No	2	15.38
Total:	**13**	**100**

Figure 4. Table of Biomechanical Treatment Prior to EPAT.

Biomechanical Treatment Prior to EPAT	Frequency	Percent (%)
Taping	9	69.23
Padding	9	69.23
Bracing	5	38.46
Soft Cast	6	46.15
Orthotics	12	92.31
Other	3	23.08

Figure 5. Table of Specific Biomechanical Treatment Prior to EPAT.

Pain Reduction After Initial Treatment	Frequency	Percent (%)
Yes	13	100
No	0	0
Total:	**13**	**100**

Figure 6. Table of Pain Reduction after Initial Treatment with EPAT.

Complete Pain Relief Following Treatment	Frequency	Percent (%)
Yes	12	92.31
No	1	7.69
Total:	**13**	**100**

Figure 7. Table of Complete Pain Relief following Treatment with EPAT.

Discussion:

Based on the data collected from this study, EPAT shows promising results in pain relief when used adjunctively with biomechanical treatment. No studies to our knowledge have been conducted with EPAT specifically treating peroneus longus tendinitis. Studies for a variety of musculoskeletal conditions have shown significant clinical and function outcomes for patients that have persistent pain and have failed conservative treatment. By utilizing EPAT, it may reduce the need for immobilization, which leads to iatrogenic muscle hypotrophy and functional decline. It may facilitate faster return to activities and decrease the need for rehabilitation.

Limitations to this study include the relatively small sample size, which can be contributed to the specificity of this particular tendinopathy with its treatment of EPAT, loss to follow up, and additional concurrent pathologies requiring treatment. Additionally, out of pocket cost of the treatment further limited the pool of patients willing to be treated. Further randomized, controlled studies would be beneficial to evaluate superiority of adjunctive EPAT on pain relief when compared to those that did not received treatment.

Conclusion:

Extracorporeal Pulse Activation Therapy is widely known for its healing effect on a variety of musculoskeletal conditions. With this study, the use of EPAT when adjunctively used with biomechanical treatment shows improvement in pain reduction and relief for patients with peroneus longus tendinitis. Further evaluation with higher-level of evidence studies comparing EPAT to treatment without its use would be beneficial to assessing its effectiveness on pain relief for patients.

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