**Efficacy of Acetic Acid Delivery via Iontophoresis on Various Anatomical Foot and Ankle Exostoses**

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**STATEMENT OF PURPOSE**

Exostoses, the formation of bone on existing bones, can develop in a variety of anatomical locations. Knowledge of physical therapy and technical advancements, or weight bear activity can cause cumulative stress and may lead to pathological changes in the tendon and the tendon’s point of insertion. The development of exostoses is a common presentation in patients with chronic foot pain.

**LITERATURE REVIEW**

Physical Therapy & Iontophoresis

Patients who experience persistent pain from conditions such as plantar fasciitis and heel spur have been noted to improve with various physical therapy modalities. Acetone delivery by means of iontophoresis for various symptoms has been noted with patients suffering from rhizarthrosis, gout, and superficial venous thrombosis. Iontophoresis uses an electric field to deliver drugs transdermally. The drug penetrates the skin in a consistent form. There are two main aspects to the use of this physical therapy device. The first is the ability of the drug to be deposited on the site of injury, while the second is the ability of the drug to be transported via a current that is created by the anode and cathode. The goal of this study is to establish a foundation for treatment plan recommendations for patients with exostoses when surgical intervention is not an option.

**IONTOPHORESIS CASE STUDY**

**Patient A – Hemodialysis Exostoses**

**History:** A 41-year-old female with a hemodialysis history for over 20 years and is a regular dialysis patient. She has noted improvement in pain and decreased exostosis size with in-office treatments using acetic acid 4% solution delivered via iontophoresis. The goal of this case study is to establish a foundation for treatment plan recommendations for patients with symptomatic exostoses when surgical intervention is not an option.

**Objective Measures:**

<table>
<thead>
<tr>
<th>Pain Score</th>
<th>Before Treatment</th>
<th>After Treatment</th>
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<tr>
<td>7/10</td>
<td>6/10</td>
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**Treatment Plan:** Physical Therapy - 1 time a week over 2 weeks completed

- Manual techniques of joint mobilization for improved ankle/hallux range of motion

**Patient B – Plantar Heel Exostoses**

**History:** A 56-year-old female who presented with plantar heel pain. She had previous history of repeated NSAIDs and physical therapy but to include acetic acid 4% solution applied via iontophoresis to the site of pain and exostosis and was noted to improve with the addition of ultrasound.

**Objective Measures:**

<table>
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<tbody>
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<td>7/10</td>
<td>5/10</td>
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**Treatment Plan:** Physical Therapy - 1 time a week over 4 weeks completed

- Phonophoresis with diclofenac sodium topical gel 5 min

**Patient C – Left Ankle Exostoses**

**History:** A 65-year-old male with a history of Type II Diabetes, arthritic changes in his left ankle and a history of previous heel surgeries. He had a history of chronic heel pain and previous treatments were noted to fail. He was noted to have a large exostosis on the posterior heel with some Achilles tendon impingement.

**Objective Measures:**

<table>
<thead>
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</tr>
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<tbody>
<tr>
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<td>3/10</td>
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**Treatment Plan:** Physical Therapy - 1 time a week over 4 weeks completed

- Manual techniques of proximal phalanx mobilization
- Ultrasound at dorsal hallux 5 min

**ANALYSIS AND DISCUSSION**

In reference to chronic foot pain

- It is important to note that ACFAS guidelines recommend 4 weeks of nonsurgical treatment and to avoid imaging tests in the setting of acute pain. This is to minimize the need for surgical intervention. In the case of isolated pain, imaging tests are recommended to assess for possible pathology. ACFAS guidelines also recommend physical therapy treatments for symptoms that are present for less than 8 weeks. The ACFAS guidelines are recommended for initial treatment with NSAIDs and physical therapy. The use of iontophoresis with acetic acid is a new approach to the treatment of exostoses and warrants further investigation.

**REFERENCES**


