Medical shockwaves a treatment option for complex and neuropathic pain syndromes? 
A compilation of case reports.

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Introduction
The impervious nature of complex and neuropathic pain syndromes which is often indolent to conventional treatments warrants the exploration of treatment methods that limit intrinsic risk while modifying disease patterns. This compilation of four case-reports discusses the use of medical shock waves for the treatment of complex and neuropathic pain syndromes of the lower extremity. 

Table 1. Presenting signs & symptoms and treatments prior to ESWT.

<table>
<thead>
<tr>
<th>Gender</th>
<th>Age (yrs)</th>
<th>Event</th>
<th>Duration</th>
<th>Severe Pain</th>
<th>Mild Inflammation</th>
<th>Temperature</th>
<th>Discr</th>
<th>Tropic Change</th>
<th>Allodynia</th>
<th>Ectopic Activity</th>
<th>Previous Tx. &amp; Working Diagnosis (WDX)</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>Female</td>
<td>3 (32)</td>
<td>Trauma</td>
<td>18mths</td>
<td>• Severe Pain</td>
<td>• Mild Inflammation</td>
<td>• Temperature</td>
<td>• Discr</td>
<td>• Tropic change</td>
<td>• Allodynia</td>
<td>• Ectopic activity</td>
<td>Physical therapy, NSAI’s, Cortisone (WDX: CRPS1)</td>
<td>* Treatment discontinued upon patient’s request. ** Treatment discontinued due to adverse reaction.</td>
</tr>
<tr>
<td>Male</td>
<td>5 (58)</td>
<td>Trauma</td>
<td>48mths</td>
<td>• Severe Pain</td>
<td>• Mild Inflammation</td>
<td>• Temperature</td>
<td>• Discr</td>
<td>• Tropic change</td>
<td>• Allodynia</td>
<td>• Ectopic activity</td>
<td>Physical therapy, NSAI’s, Foot orthotics, Cortisone (1) Local block TENS Amblyopia* (WDX: CRPS1)</td>
<td></td>
</tr>
<tr>
<td>Female</td>
<td>4 (42)</td>
<td>Trauma</td>
<td>24mths</td>
<td>• Severe Pain</td>
<td>• Mild Inflammation</td>
<td>• Temperature</td>
<td>• Discr</td>
<td>• Tropic change</td>
<td>• Allodynia</td>
<td>• Ectopic activity</td>
<td>Physical therapy, NSAI’s, Foot orthotics, Cortisone (5) GABA** (WDX: Neuropathic pain)</td>
<td></td>
</tr>
<tr>
<td>Female</td>
<td>4 (42)</td>
<td>Trauma</td>
<td>24mths</td>
<td>• Severe Pain</td>
<td>• Mild Inflammation</td>
<td>• Temperature</td>
<td>• Discr</td>
<td>• Tropic change</td>
<td>• Allodynia</td>
<td>• Ectopic activity</td>
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<td></td>
</tr>
</tbody>
</table>

Aim
To determine if further investigation is warranted to explore the use of medical shockwaves for the treatment of certain types of neuropathic and complex pain conditions.

Method
Three treatments of medium-low intensity extracorporeal-shockwaves (ESW) propagated by an electro–hydraulic generator (MediSpec, Germantown) were administered at one week intervals. Energy density flux levels ranged from 0.08mj/mm²-0.20mj/mm². Pain, function and emotional measures were performed utilizing visual analogue scale (VAS), Neuropathic Pain Diagnostic Questionnaire (DN4), and Pain Outcomes Profile (POP) questionnaire at baseline and post-treatment. Use of anti-inflammatory and pain medications were ceased prior to treatment and remained discontinued throughout the 24 week follow-up period.

Result
Improvements in function and stress levels along with reduction of the pain experience was observed post-treatment. Mean average subjective pain scores (VAS) reduced from (baseline 8.87/10 to post-treatment 2.10). Average DN4 (baseline 5.6/10) scored (0/10 post-treatment). POP questionnaire recorded improvements in both the Physical Index (baseline 53.47; post-treatment 2.77), and the Affective Index (baseline 85.49; post-treatment 10.22) respectively.

Discussion
The exact mechanism of ESWT is yet to be fully elucidated however a dose and stimulus dependant shockwave triggers a neuro-bio-chemical regulatory cascade resulting in the resolution of the associated neuro-physical pathology and cognitive response in the subjects of this case series.

Conclusion
The findings of these case-reports corroborate with the findings of earlier investigations utilizing shockwaves for complex regional pain syndrome of the knee conducted by Nortamcilo and colleagues (2010). ESW may provide a non-invasive, non-pharmacogenic disease modifying treatment option for certain types of neuropathic and complex pain conditions. This encourages further investigations of ESW to be conducted on neuropathic and complex pain syndromes of the upper and lower extremity.

Reference