



A Webinar Series Electrical Stimulation for Denervated Muscle

In six succinct sessions, we will explore how electrical stimulation techniques can enhance the well-being of individuals with denervated muscles. Practical demonstrations and cases will feature the Stimulator RISE from Schuhfried Medizintechnik GmbH.

Presented by

- Derek Jones PhD, MBA. Director, Anatomical Concepts (UK) Ltd. Blantyre, Scotland.
- Dr. Peter Biowski, Specialist in Physical Medicine and Rehabilitation, Dr. Schuhfried Medizintechnik GmbH., Vienna, Austria
- Guest speakers

Dates: 28th March, 11th April, 25th April, 9th May, 23rd May, 13th June

Time: 12:30 – 13:15 GMT on each of the scheduled dates

Platform: Zoom Webinars – limited initially to 50 participants.
Microphone muted. Q&A available

Audiences:

- Physiotherapists and Rehabilitation Doctors
- Case Managers
- Users

Possible Interactive Elements:

- Live Q&A
- Case study discussions
- Polling and audience participation
- Demonstrations of electrode placement and stimulation techniques
- Resources and references for further learning
- Pre-recorded videos

Topics

- **Webinar 1 – Introduction to Electrical Stimulation for Denervated Muscles:** This webinar introduces the topic of denervated muscle and how to manage this with electrical stimulation. We introduce the physiological principles behind electrical stimulation and why denervated muscles require "different" techniques than those used with NMES.
Speakers: Derek Jones, Peter Biowski
28th March
- **Webinar 2 – Assessment and Diagnosis for Appropriate Intervention:** Focus on assessing patients with lower motor neuron injuries or peripheral nerve damage and determining if electrical stimulation is an appropriate treatment option. What are the main contraindications?
Speakers: Derek Jones, Peter Biowski
11th April
- **Webinar 3 – Customising Electrical Stimulation Protocols:** Discuss how to tailor electrical stimulation protocols to the individual patient based on the extent of denervation, patient tolerance, and recovery goals. Include considerations for frequency, duration, and intensity of stimulation.
Speakers: Derek Jones, Peter Biowski
25th April
- **Webinar 4 – Integrating Electrical Stimulation into Rehabilitation Plans:** Offer strategies for incorporating electrical stimulation into a broader rehabilitation program, including timing, complementary therapies, and progression criteria.
Speakers: Derek Jones
9th May
- **Webinar 5 – Advanced Techniques in Electrical Stimulation:** How to assess the extent of denervation and change the stimulation protocol over time.
Speakers: Peter Biowski & Derek Jones
23rd May
- **Webinar 6 – Case Studies and Clinical Outcomes:** Present a series of case studies showcasing electrical stimulation in various scenarios of denervated muscles due to lower motor neuron injuries or peripheral nerve damage. Discuss outcomes, challenges, and lessons learned.
Speakers: Derek Jones
13th June

Webinar One - Introduction to Electrical Stimulation for Denervated Muscles:

This webinar introduces the topic of denervated muscle and how to manage this with electrical stimulation. We introduce the physiological principles behind electrical stimulation and why denervated muscles require "different" techniques than those used with NMES.

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28th March

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Content

Introduction (5 minutes)

- Introduce ourselves and our backgrounds/expertise in the topic.
- Define denervation and its impact on muscle function. Common causes of denervation and its impact on muscle function (atrophy, loss of ability to contract, etc.
- Briefly explain why standard NMES electrical stimulation techniques are less effective for denervated muscle.

The Basics of Electrical Stimulation (7 minutes)

- Define electrical stimulation (ES) in the context of muscle stimulation.
- Explain key parameters: Waveform shapes, Pulse width/Duration, Frequency, and Amplitude.
- A brief overview of the mechanism: How ES triggers muscle contractions.

Physiological Changes in Denervated Muscles (12 minutes)

- Nerve dependence of normal muscles and the consequences of losing innervation.
- Changes in muscle fibre properties: Atrophy, Fibre-type transitions (fasttwitch to slow-twitch), Decline in contractile force
- Altered membrane excitability of denervated muscle.

"Rethinking" Electrical Stimulation for Denervation (10 minutes)

- Why standard ES needs modification and optimisation for denervated muscle.
- Key changes: Much longer pulse durations, Different frequencies, Considerations for electrode type and placement
- Goals of ES for denervated muscle: Mitigating atrophy. If possible, promote muscle fibre type changes (back towards a more normal state), and Reinnervation if expected.

Conclusion & Next Steps (5 minutes)

- A brief summary of key takeaways.
- Preview what we will cover in the upcoming webinars (more in-depth stimulation protocols, evidence of effectiveness, etc.).
- Identify any Materials for Download.

Webinar Two - Assessment and Diagnosis for Appropriate Intervention:

How to assess patients with lower motor neuron injuries or peripheral nerve damage and determine if electrical stimulation is an appropriate treatment option. What are the main contraindications?

Speakers: Derek Jones, Peter Biowski

11th April

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Content

Recap (3 minutes)

- Briefly summarise key points from the previous webinar (denervation changes to muscle, why ES needs modification compared with NMES approaches).
- Highlight how this webinar builds on the previous one.

Assessment for ES Suitability (10 minutes)

- Why an assessment is vital
- Medical History:
 - Type of injury (lower motor neuron vs. specific nerve damage)
 - Time since injury (important for prognosis). Window of Opportunity for ES.
 - Any existing conditions affecting wound healing or circulation.
- Physical Examination:
 - Visual inspection for muscle atrophy
 - Manual muscle testing (if possible)
- Electrodiagnostic Studies:
 - Nerve conduction studies
 - Electromyography (EMG)
 - What these tests reveal about the potential for muscle response

Deciding if ES is Appropriate (10 minutes)

- When is ES most likely helpful?
 - Time window matters (may be less effective in the very long term)
 - Severity of denervation
- Goals: What can realistically be achieved, and how long does it take?
 - Maintaining muscle mass
 - Potentially aiding nerve regeneration (if applicable)
 - ES is NOT a replacement for nerve repair

Absolute Contraindications for ES (5 minutes)

- Active infection in the area

- Cardiac pacemakers or implanted defibrillators
- Compromised skin integrity at the stimulation site
- Severe peripheral vascular disease

Additional Considerations (2 minutes)

- Patient tolerance – the need for frequent training
- Equipment costs and availability
- Psychological factors

Conclusion & Next Steps (2 minutes)

- Brief summary
- Preview of the next webinar

Webinar Three - Customising Electrical Stimulation Protocols:

Discuss how to tailor electrical stimulation protocols to the individual patient based on the extent of denervation, patient tolerance, and recovery goals. Include considerations for frequency, duration, and intensity of stimulation.

Speakers: Derek Jones, Peter Biowski

25th April

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Content

Brief Recap (2–3 minutes)

- Remind viewers of denervation's impact on muscle response to ES.
- Reiterate why standard protocols as with NMES need adjustment.
- Aims for this session.

Understanding Key Parameters and Their Impact (10 minutes)

- Waveform shape. Impulse duration, Impulse pause, Surge Duration, Surge pause, Session duration.
- Longer pulse durations required for denervated muscle – provide ranges or common examples.
- Frequency:
 - The balance between muscle strengthening goals and fatigue with denervated fibres.
 - Twitch contractions and Tetanic contractions and their purpose
- Electrode considerations
 - Types of electrodes
 - Aim to cover as much muscle as possible
 - Placement considerations for various parts of the body

Tailoring Protocols Based on Denervation Severity (10 minutes)

- Early/Partial Denervation: What parameters might you start with?
- Complete/Long-Standing Denervation: How protocols may be more aggressive.
- Discuss the use of electrodiagnostic studies (if available) to help inform protocol choices.

Patient Tolerance and Feedback (5 minutes)

- The importance of assessing pain and discomfort during stimulation.
- Subjective feedback on muscle function – any perceived changes?

Recovery Goals and Protocol Adjustment (5 minutes)

- Maintenance goals: How protocols might look for preventing severe atrophy.
- Promoting strength/reinnervation (if applicable): More aggressive parameters or progressive changes

- Emphasise the dynamic nature of protocols – they evolve over time. Are individualised. Underscore that a "one-size-fits-all" ES approach is insufficient. Highlight the need for patient-specific protocols.

Conclusion & Next Steps (2 minutes)

- Summary of main points
- Preview the next webinar (Focus on practical setup of equipment and troubleshooting issues).

Additional Notes

- **Visuals:** If possible, include graphs or charts demonstrating how stimulation parameters influence muscle response (especially with denervated muscle).
- **Case Examples:** Brief case studies with protocol variations can illustrate these concepts in action.

Webinar 4 - Integrating Electrical Stimulation into Rehabilitation Plans:

Offer strategies for incorporating electrical stimulation into a broader rehabilitation program, including timing, complementary therapies, and progression criteria.

Speakers: Derek Jones

9th May

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Content

Recap (2 minutes) ◦ A brief review of why customised ES protocols are essential.

Starting points are based on research.

- How ES is one tool supporting denervated muscle health.

ES within the Rehabilitation Timeline (10 minutes)

- Early stages: Focus on atrophy prevention, some sensory stimulation. ◦ Potential nerve regeneration phase: Can ES support this process? (Discuss if there's good evidence).
- Long-term maintenance: Role of ES if reinnervation is incomplete.

Complementary Therapies (10 minutes)

- Passive range-of-motion exercises: Maintaining joint flexibility while muscle function is limited.
- Standing and walking with ES
- Functional training/task practice (if feasible): Promoting everyday movement, even with weakness.
- Other modalities?: Is there potential for heat, cold, etc. alongside ES?

Progression Criteria (5 minutes)

- How do you know if ES is "working"?

- Changes in muscle bulk/atrophy
 - Any improvements in voluntary strength (if possible to measure)
 - Patient's subjective reports of function and appearance
- When and how to adjust ES protocols as the patient progresses

Real-World Considerations (3 minutes)

- Home-based vs. clinic-based ES: Implications for protocols and monitoring.
- Patient motivation factors

Conclusion & Next Steps (2 minutes)

- Summary of key ideas
- Preview of the next webinar.

Webinar 5 - Advanced Techniques in Electrical Stimulation: Evaluating Denervation and Protocol Evolution with the Schuhfried RISE Stimulator

How to assess the extent of denervation and change the stimulation protocol over time.

Speakers: Peter Biowski & Derek Jones

23rd May

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Content

Brief Overview (3 minutes)

- The limitations of standard assessment in quantifying denervation.
- Why monitoring denervation status over time matters for protocol optimisation.

Introducing the Schuhfried RISE (5 minutes)

- Key features specifically relevant to denervated muscle treatment and assessment:

- Impulse testing capabilities
 - Specific software or analysis tools it provides
 - Home usage
- How it differs from basic ES devices

Impulse Testing for Denervation Assessment (10 minutes)

- Explain the concept of impulse testing (strength-duration curves, etc.).
- How the RISE facilitates this process.
- Interpretation of results: What do the outputs tell you about the muscle?

Utilising Assessment Data to Guide Protocols (8 minutes)

- How initial denervation severity influences the starting ES parameters. ◦ Using impulse tests for follow-up: How do changes guide protocol modification?
- Integrating the RISE data with other outcome measures (visual inspection, manual testing, etc.).

Practical Considerations (4 minutes)

- Accessibility of the Schuhfried RISE (at home or clinical settings?) ◦ Learning curve for using the device and interpreting results.

Conclusion & Next Steps (2 minutes)

- Recap the advantages of nuanced assessment for ES optimisation.
- Preview the final webinar (perhaps on outcome tracking or patient perspectives on ES).

Enhancements

- **Demonstration:** Include a brief demonstration of the Schuhfried RISE in use (even a pre-recorded clip).
- **Case Study:** An example illustrating how impulse testing informed protocol choices over time would be highly impactful.

Webinar 6 - Case Studies and Clinical Outcomes:

Present a series of case studies showcasing electrical stimulation in various scenarios of denervated muscles due to lower motor neuron injuries or peripheral nerve damage. Discuss outcomes, challenges, and lessons learned.

Speakers: **Derek Jones**

13th June

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Content

Introduction (3 minutes)

- Importance of translating theory and protocols into clinical practice. ◦
The value of case studies in highlighting the possibilities and limitations.

Case Study Series (20 minutes)

- Choose 3–4 diverse case studies with variations in:
 - Type of injury (peripheral nerve vs. lower motor neuron)
 - Stage of injury (acute vs. long-standing denervation)
 - Goals of ES (preventing atrophy, facilitating functional recovery, etc.)
- For each case, briefly cover:
 - Patient presentation
 - ES protocols used (and how they evolved)
 - Outcomes achieved (be honest about successes AND less favourable **Critical** results)
 - Challenges faced

Discussion of Clinical Outcomes (5 minutes)

- What patterns emerge from the case studies?

- Link back to evidence from the literature (if possible): Do the case studies support it?

Critical Lessons Learned (2 minutes)

- Summarise crucial takeaways for clinicians regarding ES for denervation.

Suggestions on Presentation

- **Visuals:** Images/videos of the patients during treatment enhance the cases.
- **Outcome Measures:** Include hard data (muscle size changes, strength measures) if we have it.
- **Patient Voice:** A quote or brief video message from a patient involved in one of the case studies adds a powerful dimension.

How to Choose Cases

To make the webinar impactful, we could consider organising the cases in a few ways:

- **By Severity:** Present them from a mild/partial denervation scenario to a more severe case, showing how ES applications change.
- **By Time:** Start with cases in an earlier stage of denervation, followed by those several years post-injury, to illustrate the shifting role of ES.
- **By Success:** One highly successful case, one with mixed results, and one less successful case can offer a realistic view of the potential.