Novel Techniques in the Management of Ankle Sprains

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Overview of the Workshop

- Brief Review Current Management of Ankle Sprains
- What has changed in the last 60 years?
- Novel Techniques for immediate application to your clinical practice
- Some OLD ideas and some NEW ideas
Evidence-Based Practice

Best Research

Clinical Experience

Patient Values
Current State of AT Practice

- Best Research
- Clinical Experience
- Patient Values
# Evidence Categories

## SORT Taxonomy

<table>
<thead>
<tr>
<th>Level of Evidence</th>
<th>SORT Grade</th>
<th>Clinical Practice</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>Based on consistent and good-evidence</td>
<td>No Brainer!</td>
</tr>
<tr>
<td>B</td>
<td>Based on inconsistent or limited-quality evidence</td>
<td>Should probably include in our clinical practice</td>
</tr>
<tr>
<td>C</td>
<td>Based on consensus usual practice</td>
<td>Up to you</td>
</tr>
</tbody>
</table>
Not the Place to Find Novel Techniques!!

Diagnosis, treatment and prevention of ankle sprains: an evidence-based clinical guideline

Gino M Kerkhoffs,1 Michel van den Bekerom,2 Leon A M Elders,3 Peter A van Beek,4 Wim A M Hullegie,5 Guus M F M Bloemers,6 Elly M de Heus,7 Masja C M Loogman,8 Kitty C J G M Rosenbrand,9 Ton Kuipers,10 J W A P Hoogstraten,11 Rienk Dekker,12 Henk-Jan ten Duis,13 C Niekh van Dijk,14 Maurits W van Tulder,15 Philip J van der Wees,16 Rob A de Bie16

and physical therapists and other involved professional groups and to define the framework within which the multidisciplinary care of patients with ankle injuries has to take place. This guideline will also contribute to improved communication between healthcare professionals.

Target group
The guideline is meant for all care providers who are involved in the treatment and guidance of patients with ankle injuries: family physicians, physical therapists, orthopaedic surgeons, trauma surgeons, rehabilitation physicians, radiologists, occupational physicians, sports physicians and professionals involved in sport massage.
Ankle Sprains are a BIG Problem

• Most common injury of the physically active
• 1 out of 3 people who sustain a LAS continue to have residual symptoms (Hertel JAT2002;37(4))
• Chronic Ankle Instability (CAI)
Functional Rehabilitation

Current Gold Standard for Ankle Sprain Management

Stabilization + Progressive Exercise

Functional Treatment

**Grade 1**

- Elastic Wrap
- Air-Cast
- Air Cast + Elastic Wrap

**Grade II**

- Elastic Wrap
- Air-Cast
- Air Cast + Elastic Wrap
- Below Knee Walking Cast

# Functional Treatment of Ankle Sprains

<table>
<thead>
<tr>
<th>Outcome</th>
<th>I</th>
<th>II</th>
<th>III</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Elastic Wrap</td>
<td>Air-Stirrup Ankle Brace With Wrap</td>
<td>Air-Stirrup Ankle Brace With Wrap</td>
</tr>
<tr>
<td>Primary outcomes</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>No. of days required to return to:</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2. Normal (preinjury stair climbing)</td>
<td>12.05</td>
<td>11.43</td>
<td>5.46</td>
</tr>
</tbody>
</table>

How to Break the Cycle?

- Injury
- Functional Rehab
- Re-Injury
- Functional Rehab
Functional Ankle Rehabilitation

Motor Rehabilitation

RICE
- Balance Training
- Range of Motion
- Resistive Exercise
- External Supports

50-70% Re-Injury rate

Return to Activity
Functional Ankle Rehabilitation

Motor Rehabilitation
- RICE
- Balance Training
- Range of Motion
- Resistive Exercise
- External Supports

Sensory Rehabilitation
- Massage
- Joint Mobilizations
- Muscle Tendon
- At Home

Return to Activity
Sensory Targeted Ankle Rehabilitation Strategies

STARS

Sensory (Perception)

Motor (Action)

↑ Functional Performance?

Enhancing Sensorimotor Freedom?

↓ Episodes of Giving Way?

Gait and Landing Enhancements?

Balancing Improvements?

Musculotendinous Stretching (Triceps Surae)

Ankle Joint Mobilization

Plantar Massage

Improved Muscular Responses?

Wikstrom & McKeon Sensory-targeted ankle rehabilitation strategies
2015 Lower Extremity Review and 2015 EATA Research to Reality
<table>
<thead>
<tr>
<th>Intervention</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ankle joint mobilization</td>
<td>Two two-minute sets of joint mobilizations in which one-second large amplitude (grade III) oscillations are performed. Over the course of the five-minute treatment, patients receive approximately 60 oscillations.</td>
</tr>
<tr>
<td>Plantar massage</td>
<td>Five minutes of foot massage that combines effleurage and petrissage on the plantar surface of the foot. Similar to joint mobilizations, use two two-minute sets of plantar massage with a one-minute rest between each set.</td>
</tr>
<tr>
<td>Triceps surae stretching</td>
<td>Two sets of heel cord (ie, calf) stretching with a slightly flexed knee to target the soleus. Each set will consist of three 30-second stretches with 10-second rests between stretches and one minute between sets.</td>
</tr>
</tbody>
</table>
Sensory-Targeted Ankle Rehabilitation Strategies

• Improvement in Dorsiflexion, Balance and Self Reported Function in subjects who have CAI

• Introduce during the acute and sub-acute phase of rehabilitation

Wikstrom and McKeon NIH Grant
Investigating the Mechanisms of Massage Efficacy: The Role of Mechanical Immunomodulation

Christine Waters-Banker, PhD, ATC*; Esther E. Dupont-Versteegden, PhD*; Patrick H. Kitzman, PhD*; Timothy A. Butterfield, PhD, ATC, FACSM*

- Massage therapy activates potentially beneficial immunomodulatory pathways
- Application of a 30-minute bout of massage once each day over 4 days reduced the amount of cellular infiltration and tissue necrosis
- Less inflammation and edema which improved function
- Delay in massage application decreases the effectiveness for reducing secondary hypoxic injury
Massage

- Decrease leukocyte infiltration and myofiber damage
- Delaying the application for 24 h did not result in the same improvement of function compared to when the compressive loading (massage) was initiated within 30 min

OF MICE AND MASSAGE

One researcher in Kentucky is examining the effectiveness of rehabilitative massage on the tiniest and furriest of subjects

— By Jaimie Siegle

why these muscles are responding so well [to massage],” he said. “We’re looking at all the points of inflammation at six, 12, 18 and 24 hours, to see if the immune response of exercise muscle is different over time.”

One key takeaway from their study? When it comes to massage, less is more. “We did find that massaging tissues for 15 minutes is as effective as massaging for 30 — at the right load,” he clarified. “For humans it seems to be about 35 Newtons [7.9 lbs], which is probably uncomfortable but seems to be most effective.”

A few unexpected findings include that it’s best to apply massage therapy sooner, rather than later. “We’ve found that if we don’t apply massage immediately after a damaging exercise bout and delay massage by 12-24 hours, it’s as ineffective as applying no massage at all.” Another surprising result was that there
24.0% to 52.2% of the total number of treatments were massage

Most were non-specific
Protection

• When did compression become synonymous with protection?
What is your Definition of Rest?

- Taking in easy
- No Activity
- No Movement
- While cryotherapy and elevation are applied
- Movement that does not increase pain
Maybe it is all in the Acronym?
PRICE needs updating, should we call the POLICE?

C M Bleakley,¹,³ P Glasgow,²,³ D C MacAuley⁴

The acronym PRICE (protection, rest, ice, compression and elevation) has been central to acute soft tissue injury management for many years despite a paucity of high-quality, empirical evidence to support the various components or as a collective treatment package adverse changes to tissue biomechanics and morphology. Progressive mechanical loading is more likely to restore the strength and morphological characteristics of collagenous tissue.⁴ ⁵ Indeed, early mobilisation with accelerated rehabilitation is effective after acute ankle strain.⁷ Functional rehabilitation of ankle sprain loading in acute soft tissue injury management. Optimal loading is an umbrella term for any mechanotherapy intervention and includes a wide range of manual techniques currently available; indeed the term may include manual techniques such as massage refined to maximise the mechano-effect. Paradoxically, crutches, braces and supports, traditionally associated with rest, may have a greater role in adjusting and regulating optimal loading in the early stages of rehabilitation.

POLICE should make us think more about research into designing rehabilitation strategies that are appropriate to the nature and severity of injury in different sports and activities. If the primary princi...
Acute Care

**PRICE**
- Protection
- Rest
- Ice
- Compression
- Elevation

**POLICE**
- Protection
- Optimal Loading
- Ice
- Compression
- Elevation

Bleakley et al. PRICE needs updating, should we call the POLICE? BJSM, 2012 46(4), 220–221.
Speaking of ACRONYMS Maybe We Need to Change our Clinical Diet?
Movement to Pain Tolerance

Controlled Exercise

Pain Management

Modalities
High Voltage Pulsed Current (HVPC)

• Long touted by clinicians as an effective tool in managing pain and edema and thereby hastening recovery

• No evidence that it hastens recovery!!
Effects of cool water immersions and high voltage electrical stimulation on edema formation following blunt trauma to the hind limbs of rats

Michael G. Dolan, MA, ATC, CSCS
Anna M. Mychaskiw ATC
Frank C. Mendel, PhD

JAT 2003, 38(3) 225-30
Funded EATA Research Grant
Normal State of Capillary Physiology

Capillary Walls

Plasma Proteins

Endothelial Cells

Tissue Cell

Tissue Cell

Lymph Gland
Inflammatory Process

Edema Formation

Endothelial Cells

Tissue Cell

Lymph Gland
Proposed Mechanism of Action

Smooth Muscle Actin and Myosin

Capillary Walls

Endothelial Cells

Tissue Cell

Lymph Gland

Curbing of Edema
Effects of Continuous Treatment on Edema Formation

"Golden Minute" for Acute Management

Dolan et al. JAT 2003, 38(4) 225-229
Effect of high-voltage pulsed current on recovery after grades I and II lateral ankle sprains

Does aggressive application of HVPC influence recovery?
Days Lost To Injury

![Bar graph showing days lost to injury for Grade 1 and Grade 2 HVPC Live and Sham treatments.]

Days Lost

HVP C

Grade 1

Grade 2

Live

Sham

* p=.0498

JSR 2010 19(4) 399-410 Mendel, Dolan, Marzo, Fish, Wilding
Is Amount of Time Treated Related to RX Effect?

- Cont. HVPC: 85%
- HVPC: 1%
- Elevation: 17%
- Compression: 96%
- Cryotherapy: 6%
Heat or Cold for Acute Pain?

- Acute Joint Injury
- Chronic Tendon Injury
- Low Back Pain
- DOMS
- Nerve Injury

?
Subjects with non-specific low back pain

Do heat wraps worn overnight affect pain, stiffness and ROM?

Heat Wrap worn overnight

Control

Overnight use of heatwrap therapy provided effective pain relief throughout the next day, reduced muscle stiffness and disability, and improved trunk flexibility. Positive effects were sustained more than 48 hours after treatments were completed.

Which Interventions Improve Outcomes of Ankle Sprains?

- 4098 Eligible Studies
  - 72 Studies Reviewed in Detail
    - 23 Reviewed Studies
      - 9 Electrophysical
      - 7 NSAID
      - 2 Manual Therapy
      - 2 Alternative
      - 2 Neuromuscular
      - Hyperbaric O2
  - 49 Excluded
  - 4012 were excluded
Minimal evidence that these interventions curb traditional signs of inflammation or hasten recovery

Effects of piroxicam on ankle sprains in military recruits

- NSAID’s improve function at day 14, 1,3 and 6 months
- BUT
- Reported that treated ankles had mechanical instability at days 3, 7 and 14 days
- Some controversy exists regarding long term benefit
- SORT Grade = A

Slater et al. AJSM 1997 25:544-553
Topical NSAID’s

- Ketoprofen patch applied over the painful region 1 time per day for 7 days
- This intervention resulted in reduced pain and swelling and improved self-reported function as compared to control limbs
- Well tolerated and no systemic side effects as opposed to oral NSAID’s
A Randomized Controlled Trial of a Passive Accessory Joint Mobilization on Acute Ankle Inversion Sprains

- Addition of a posterior-anterior joint mobilization increased stride length and hasten time to pain free joint mobilization
- More effective than ice alone
- Not allowing inflammation to limit range of motion

Mobilization with Movement

- Clinician leans backward creating a Posterior to Anterior glide
- Forefoot is stabilized and glide is applied to the talus
- Patient moves knee over the second and third toes
- MWM increased ankle DF

Video of MWM to Increase DF
NWB Mobilization with Movement

• Glides the talus anteroposteriorly
• Tibia is fixed against plinth
• Active dorsiflexion of the ankle to end of available pain-free motion
MWM Non-Weight Bearing
Anterior Positional Faults

- Brian Mulligan introduced the concept of anterior positional fault of the fibula following lateral ankle sprains.
- Tension of the ATF during plantar flexion/inversion caused the fibula to displace anteriorly which increases pain and swelling.
Anterior Positional Faults

- Sub-acute sprains had increased anterior positioning of the fibula as compared to the uninjured limb and matched controls.

- Strong correlation between anterior positioning of the fibula and swelling.

Joint Mobilization to Correct an Anterior Positional Fault
Tape Job to Maintain Mobilization Position
Mobilization and Tape Job
Joint Mobilizations

SORT Grade = B

Joint Mobilizations should be an integral part of a comprehensive rehabilitation program

A- and moving toward an A
Treatment of Cuboid Syndrome Secondary to Lateral Ankle Sprains: A Case Series

Jason Jennings, DPT, SCS, ATC, MTC, CSCS
George J. Davies, PT, DPT, MEd, SCS, ATC, LAT, CSCS, FAPTA
Plasma rich in growth factors (PRGF) as a treatment for high ankle sprain in elite athletes: a randomized control trial

Lior Laver · Michael R. Carmont · Mark O. McConkey ·
Ezequiel Palmanovich · Eyal Yaacobi · Gideon Mann ·
Meir Nyska · Eugene Kots · Omer Mei-Dan

**Table 1** Mean (SD) demographics by treatment group

<table>
<thead>
<tr>
<th>Variable</th>
<th>PRP</th>
<th>Control</th>
<th>Total</th>
<th>p</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mean age in years (SD)</td>
<td>22.6 (4.2) y</td>
<td>22.0 (4.8) y</td>
<td>22.3 (4.4) y</td>
<td>n.s</td>
</tr>
<tr>
<td>Side (count)</td>
<td>R = 5, L = 3</td>
<td>R = 3, L = 5</td>
<td>R = 8, L = 8</td>
<td></td>
</tr>
<tr>
<td>Mean RTP in days (SD)</td>
<td>40.8 (8.9)</td>
<td>59.6 (12.0)</td>
<td>49.5 (14.0)</td>
<td>0.006</td>
</tr>
<tr>
<td>Residual pain (n %)</td>
<td>1/8 (12.5 %)</td>
<td>5/8 (62.5 %)</td>
<td>6/16 (37.5 %)</td>
<td></td>
</tr>
<tr>
<td>Median Tegner Activity Level (range)</td>
<td>9 (range 7–10)</td>
<td>9 (range 7–10)</td>
<td>9 (range 7–10)</td>
<td>n.s</td>
</tr>
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</table>

*RTP return to play*
Cell Phones May Cause Cancer? I’ve Got to Text My Friends About This Danger...

Maybe Cell Phones Can Prevent Ankle Injuries!
Take out your phone!

Go to your App Source and search for Ankle App

Ankle ReApp  University of Ulster

Verhagen E. Br J Sports Med 2015;49.1220
Effects of Topically Applied Comfrey on Ankle Sprains

- Topically applied Comfrey Product (Traumaplant) 4X per day
- Significant Reduction in Pain and Swelling
- 300+ Subjects in a Double Blind RCT

Kinesiotape

• Claims to lift the skin to allow lymphatic and venous drainage.
• The opposite of Compression!!!!!!!
Best Practices

The Take Home Message

- Apply intervention ASAP and consider extended treatment times
- Consider sub-acute interventions during the Acute phase of injury
- Joint Mobilizations and Manual Therapy During the Acute Phase
Best Practices
The Take Home Message

Motor and Sensory Rehabilitation

Strong evidence that NSAID’s reduce pain and swelling and improve function

Alternative treatments will continue to emerge- Keep an open mind!
• “An open mind allows you to explore and create and grow. Remember that progress in all endeavors would be impossible if we always did things the way we always have.”
Thank You

The Peter Canisius Distinguished Teaching Professorship
Thank You for Attending!
Questions?

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