CHRONIC ANKLE INSTABILITY
CLINICAL PRACTICE GUIDELINE

Background

Chronic ankle instability (CAI) is a common clinical condition characterized by the tendency of the ankle to "give way" during normal activity and may occur in the absence of true mechanical instability. It may develop after a single event, or may be part of an ongoing process that leads to functional ankle instability and the subjective feeling of the ankle giving way. Up to 40% of acute ankle sprains will develop CAI, however progression from acute ankle sprains to CAI is not well understood. It becomes termed CAI if instability has persisted for greater than 6 months.

It is hypothesized that CAI may develop due to a loss of mechanoreceptors within the ankle joint. Furthermore, clinical laxity may be a confounding factor in CAI and may not be present in all those with perceived instability. Less than 50% of CAI patients demonstrate true clinical laxity, while 20% of copers demonstrate clinical laxity. CAI likely results from a combination of several factors including poor proprioception, impaired strength and patient perception.

Current literature classifies CAI into two groups: mechanical and functional instability. Mechanical instability implies loss of normal anatomic restraint to lateral ankle stability, while functional instability results secondary to a loss of proprioception and neuromuscular control.

Proprioception has been found to be a key management strategy in CAI. Several studies show that patients with CAI demonstrate reduced performance on several proprioceptive and functional tests such as the Y-Balance, single-leg balance and hop testing. Furthermore, literature reveals that the inclusion of proprioceptive and neuromuscular control training strategies result in improved functional performance and improved patient reported outcomes.

Disclaimer

Progression is time and criterion-based, dependent on soft tissue healing, patient demographics, and clinician evaluation. Contact Ohio State Sports Medicine at 614-293-2385 if questions arise.

Definitions

- **Strong level evidence**: supported by systematic review, meta-analysis, or >5 RCT
- **Moderate level evidence**: supported by 3-4 RCT
- **Low level evidence**: supported in 1-2 RCT or clinical case series
- **Expert opinion**: supported by case studies, expert opinions or opinions of the authors
**Summary of Recommendations**

**Risk Factors**

- **Modifiable Risk Factors** *(strong level evidence)*:
  - Indoor and court sports
  - High intensity training > 3 days/week
  - Poor neuromuscular control (impaired proprioception)

- **Non-modifiable risk factors** *(strong level evidence)*:
  - Female
  - Younger age
  - Higher BMI and height
  - Hindfoot and midfoot alignment (hindfoot varus, midfoot cavus)

**Examination**

- Standing foot alignment
  - Neurovascular exam (Repeated sprains may propagate peroneal neuropathy)
  - Beighton Scale for Systemic Hypermobility
  - ROM: Weight Bearing DF lunge
  - Strength (Dynamometry)
  - Mechanical Instability Testing
    - Anterior Drawer Test
    - Talar Tilt
  - Functional Instability Testing
    - Y-Balance
    - Foot Lift Test
  - Functional Hop Testing

**Differential Diagnosis**

- Chronic Ankle Instability
- Peroneal Neuropathy
- Peroneal Tendinopathy

**Manual Therapy**

- Talocrural joint mobilizations
- Hindfoot, midfoot mobilizations
- Soft tissue mobilization PRN

**Corrective Interventions**

- ROM – emphasis on dorsiflexion
- Ankle strength, foot intrinsic strengthening
- Hip/core stability
- Balance/proprioception progressions into functional movement training

**Outcome Tools and Testing**

Consider patient reported outcome measures

1. FAAM
2. TSK-11

Functional Testing

1. Y-Balance
2. Foot Lift Test
3. Functional Hop Testing

**Criteria for Return to Sport/Discharge**

1. Subjective Outcome Measure > 90%
2. DF Lunge > 7.5 cm
3. Y-Balance > 90% composite
4. Foot Lift Test < 5 errors
5. Functional Hop Testing > 90% LSI
6. Physician clearance (if required)
# Phase I: Acute Phase of Rehab and Return to Activity

## Neuromuscular Control/Balance Training

*strong level evidence*

Optimize and restore active stability by training with examples such as:

- Proprioceptive and balance training
- Balance training
- Single leg stance
- Single leg squat
- Heel raise
- Lunge/jump exercise
- Tandem stance
- Drop jump

- Wobble Board
- Trampoline training
- De-stabilization device training
- Jump training
- Agility testing
- Multi-directional hopping
- Combined functional movement

## Strengthening Exercises

*low level evidence*

Strengthening exercises have been shown to improve strength and perceived instability, but may not have functional benefits for individuals with CAI. The goal of strength training for individuals with CAI is to provide improved dynamic stability of the ankle to reduce potential subsequent episodes. Recommended intervention progression includes:

- Band strengthening
  - 4 way ankle
    - Inversion strengthening most effective (preventative effect for improving control of foot)
  - Proprioceptive neuromuscular facilitation diagonals
- Foot intrinsic strengthening
  - Splaying
  - Doming
    - Seated → functional movements
  - Great toe extension
  - Ankle PF with great toe flexion
  - Toe curls

## Manual Therapy

*low level evidence*

Manual therapy may have a role in improving joint mobility for ankle dorsiflexion. Considerations should include soft tissue surrounding the ankle (triceps surae), as well as accessory joint mobility of the talocrural, subtalar, and distal Tibio-fibular joints. The goal of utilizing manual therapy techniques for individuals with CAI is to promote improved arthrokinematics of the foot and ankle joints, and to facilitate improved dorsiflexion ROM and proprioception of the ankle/foot complex.

## Bracing/Taping

*strong level evidence*

Evidence indicates that bracing may or may not provide additional therapeutic benefit. It may be added at the treating therapist’s discretion to improve postural control by increasing the stability of the ankle joint, increasing foot control motion or increasing proprioceptive capabilities. As bracing has been shown to potentially alter muscular recruitment around the ankle, it is NOT recommended that the patient wear bracing during treatments. No injury prevention benefits have been recognized in literature. Recommended bracing/taping techniques to consider:

- Low dye taping (modified or standard)
- Ankle taping
- K-tape (Facilitation of ankle evertors with posterior glide of distal fibula)
- Figure 8 brace (lace up with lateral stirrups)

## Discharge Criteria / Criteria to Progress

*expert opinion*

- DF ROM 90% of uninvolved side
- FAAM score ≥ 1 MCID improvement
- ≤ 1 incidences of perceived instability with functional activities in a 2 week period
## Rehabilitation Phase II: Return to Sport Considerations

### Factors to Consider Prior to Return to Play
- Demands of the athlete’s sport
- Position
- Competition level
- Rules on taping/bracing

### Strengthening Exercises

**low level evidence**

- Utilize end range strengthening for ankle plantarflexors, evertors, and invertors. Manipulate training to include both endurance and power considerations based on sport. Include proximal stabilization of the hips and core to reduce burden on ankle strategy. Interventions can include:
  - Single leg calf raises (Neutral → start in DF)
  - Triple extension exercise
  - Foot intrinsic strengthening
    - Splaying
    - Doming
    - Seated → functional movements
  - Great toe extension
  - Ankle PF with great toe flexion
  - Toe curls
  - Planks
  - Side planks
  - RDL’s
  - Hip Abductors
  - Hip Extensors
  - Bridging

### Neuromuscular Control/Balance Training

**strong level evidence**

- Neuromuscular training for athletes with CAI should focus on improving proximal core activation/control, dynamic (reactive) ankle strategies, and control of functional movements. Suggested interventions include:
  - Diaphragmatic breathing/breathing patterns
  - Rolling patterns
  - Balance on dynamic surfaces (tilt board → BOSU)
  - Crawling patterns
  - Movement re education
    - Lunging
    - Squatting
    - SL dead lift
    - Heel tap
    - Step up
    - Step outs
    - Hops

### Agility Training and Sport Specific Drills

**low level evidence**

- Consider periodization (in season v. out of season athlete), power v. endurance and cardiovascular conditioning with these intervention options:
  - Lateral shuffling
  - Carioca
  - Figure 8 drills
  - Cone drills
  - Back pedal
  - Ladder drills
  - Resisted jogging (sport cord)
  - Hop training
  - Drop counter jump
  - Change of direction drills

### Criteria for Return to Play

**moderate level evidence**

- Functional Hop Testing
- LSI ≥90% for all tests
- Star Excursion Balance Test within 4 cm in anterior direction
- Single leg stance time within 90% of contralateral limb
  - Consider addition of eyes closed
  - < 5 errors on foot lift test
- Strength within 90% of contralateral limb using hand held dynamometry
- Pain ≤ 1/10 with activity
- No reactive edema in 24 hours post activity
- Ankle ROM: within 90% of contralateral limb using standard techniques
  - DF Lunge > 7.5 cm
- Outcome Tool
  - FAAM with ≤ 1 MCID from full score (9 points)
  - Consider utilization of TSK-11
Failure of Conservative Management

Definitions
Failure of conservative management for chronic ankle instability can be managed surgically with a Brostrom procedure. Several factors may contribute to failure of conservative treatments, and failure can be identified as the continued presence of mechanical or functional ankle instability for 6 months following injury and 3 months of treatment. Brostrom procedures typically are performed with two variations: The Brostrom Evans or the Brostrom Gould procedure. Each procedure seeks to repair or recreate the ATFL to restore ankle stability. Post-operative outcomes are generally rated as excellent, with 90-95% of patients reporting full return to pre-morbid activity. Additionally, 90-95% of high level athletes return to sport within 6 months, although longevity of career and performance level have not been well followed.

Brostrom Gould Procedure
The ATFL is debrided and repaired, and a portion of the inferior extensor retinaculum is stretched over the ATFL to reinforce the ligament.

Brostrom Evans Procedure
In addition to the above, 1/3 of the peroneus brevis muscle is split off and threaded through the fibula, anchoring it to the lateral talus.

Operative considerations: Surgical repair is not indicated for individuals with systemic hypermobility. The following symptoms are considered to be a negative prognostic factor for outcomes following a Brostrom repair:
- Osteochondral defects ~20%
- Synovitis ~63%
- Impingement ~10%
- Tendon dysfunction
- Medial ankle instability (MRI)
- Syndesmotic instability (MRI)
- Obesity (BMI ≥ 30 kg/m²)

Intra and extra-articular confounders, such as synovitis and OCD, can be managed with arthroscopic repair. This repair is typically performed in conjunction with the primary repair.

Most frequent post-operative changes: The following are all considered normal changes following Brostrom repairs:
- Loss of inversion ROM up to 15 degrees
- Ankle eversion strength deficit of 10%
- Decreased balance, with increased postural sway
- Decreased proprioception
## Rehabilitation Recommendations: Acute Stage (weeks 0-6)

<table>
<thead>
<tr>
<th><strong>Weight Bearing</strong>&lt;br&gt;Strong level evidence</th>
<th>• NWB 4-6 weeks</th>
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<tbody>
<tr>
<td><strong>ROM Interventions</strong>&lt;br&gt;Strong level evidence</td>
<td>Passive ROM within tolerance&lt;br&gt;• Avoid forceful inversion</td>
</tr>
<tr>
<td><strong>Strengthening</strong>&lt;br&gt;Strong level evidence</td>
<td>Primarily focused on activation of musculature surrounding the ankle.&lt;br&gt;• Sub maximal 4 way ankle isometric&lt;br&gt;  o Multiple angles as tolerated&lt;br&gt;  o Caution with inversion and eversion positioning&lt;br&gt;• Foot intrinsic strengthening&lt;br&gt;  o Splaying&lt;br&gt;  o Doming&lt;br&gt;    • Seated → functional movements&lt;br&gt;  o Great toe extension&lt;br&gt;  o Ankle PF with great toe flexion&lt;br&gt;  o Toe curls</td>
</tr>
<tr>
<td><strong>Manual Therapy</strong>&lt;br&gt;Low level evidence</td>
<td>As needed:&lt;br&gt;• Low grade joint mobilizations of accessory joints surrounding the repair. DO NOT INCLUDE TALOCRURAL/SUBTALAR&lt;br&gt;• Retrograde mobilization</td>
</tr>
<tr>
<td><strong>Modalities</strong>&lt;br&gt;Low level evidence</td>
<td>• Should be utilized in the acute stage of rehabilitation to minimize edema</td>
</tr>
<tr>
<td><strong>Criteria to Progress</strong>&lt;br&gt;Moderate level evidence</td>
<td>• Progression into weight bearing&lt;br&gt;• PROM ≥ 75% of uninvolved&lt;br&gt;• Ability to bear weight without increase in pain</td>
</tr>
</tbody>
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Rehabilitation Recommendations: Return to Function Stage (weeks 6-12)

<table>
<thead>
<tr>
<th>Weight Bearing Restrictions</th>
<th>Full weight bearing, progressing to normal gait pattern. Normal ambulation without an AD no later than week 9.</th>
</tr>
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<tbody>
<tr>
<td>ROM Interventions</td>
<td>Active ROM within tolerance&lt;br&gt;• Monitor inversion&lt;br&gt;• Utilize kneeling DF stretch</td>
</tr>
<tr>
<td>Strengthening Interventions</td>
<td>Focused on full ROM, with special emphasis on end range training.&lt;br&gt;• Calf raise series&lt;br&gt;  ○ Double leg → 2 up, 1 down → Single leg&lt;br&gt;  ○ Progression of forces&lt;br&gt;  ▪ Seated → partial weight bearing (shuttle, leg press) → body weight against gravity&lt;br&gt;  ○ Maintain neutral ankle positioning (no inversion at end range)&lt;br&gt;• Foot intrinsic strengthening&lt;br&gt;  ○ Splaying&lt;br&gt;  ○ Doming&lt;br&gt;  ○ Seated → functional movements&lt;br&gt;  ▪ Great toe extension&lt;br&gt;  ○ Ankle PF with great toe flexion&lt;br&gt;  ○ Toe curls&lt;br&gt;• Core strengthening (see return to function considerations above)&lt;br&gt;• Functional movement training&lt;br&gt;  ○ Squat&lt;br&gt;  ○ Lunge&lt;br&gt;  ○ Heel tap&lt;br&gt;  ○ Step up</td>
</tr>
<tr>
<td>Neuromuscular reeducation</td>
<td>Evidence supports the improvement of passive and dynamic (reactive) balance for return to activity. Suggested interventions include:&lt;br&gt;• BAPS board&lt;br&gt;  ○ Seated → standing&lt;br&gt;• Single leg stance&lt;br&gt;  ○ Firm surface → foam surface → dynamic surface&lt;br&gt;• Functional movement training&lt;br&gt;  ○ Squat&lt;br&gt;  ○ Lunge&lt;br&gt;  ○ Heel tap&lt;br&gt;• Step up</td>
</tr>
<tr>
<td>Manual Therapy</td>
<td>Manual therapy should be utilized sparingly at this stage of rehabilitation. Joint mobilizations to improve ROM PRN</td>
</tr>
<tr>
<td>Modalities</td>
<td>Modalities are not recommended at this time. Patient may require ice bags after treatment</td>
</tr>
<tr>
<td>Criteria to Progress</td>
<td>Normalized gait pattern without compensation&lt;br&gt;• PROM ≥ 90% of uninvolved&lt;br&gt;• Single leg stance ≥ 90% of uninvolved limb on firm surface&lt;br&gt;• Inversion/Eversion Strength ≥ 90% of uninvolved via hand held dynamometry&lt;br&gt;• Plantar Flexion strength: 25 SL calf raises&lt;br&gt;• No edema (figure of 8 or volumetric measurement)&lt;br&gt;  ○ May return to running if all of the above are met.</td>
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Return to Sport Stage (12-26 weeks): see non-operative criteria above
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References


