At the RNOH, our emphasis is patient specific, which encourages recognition of those who may progress slower than others. We also want to encourage clinical reasoning.

**Milestone Driven**
These are milestone driven guidelines designed to provide an equitable rehabilitation service to all our patients. They will also limit unnecessary visits to the outpatient clinic at RNOH by helping the patient and therapist to identify which specialist review is required.

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**Indications for Surgery**
- Chondral/Osteochondral defects of the talar dome following traumatic onset
- Osteochondritis dissecans that has not responded to conservative management

In both indications the patient will usually have failed to respond to an initial arthroscopic debridement or have a lesion large enough that arthroscopic debridement will be unlikely to be successful. This is because cartilage regeneration by membrane techniques are invasive and expensive and should only be used as part of formalised audit or a clinical trial.

**Possible Complications**
- Infection
- Bleeding
- Nerve damage
- Deep Vein Thrombosis
- Pulmonary Embolism
- Scarring
- Persistent / Recurrent pain
- Talo-crural and sub-talar joint stiffness
- Failure of implant
- Persistent / Recurrent joint crepitus
- Numbness / Pins & Needles in the foot
**Surgical Techniques**
The exact technique used will depend on the location and size of the defect. Surgery involves laying a PGA-HA membrane over an osteochondral lesion of the talus. This may involve bone grafting techniques for cavitary / cystic defects. No sutures are used to secure the graft.

In some cases the surgery is performed arthroscopically, but in many cases it is difficult to gain access to the joint and hence the ankle joint is accessed through a controlled ‘break’ in the ankle bone called an osteotomy. After the operation, the osteotomy is reduced anatomically and held in place with screws or a plate. This can make rehabilitation slower.

**Expected Outcome**
- Improved function / mobility
- Decreased pain with decreased analgesic requirements
- Decreased joint clicking/locking
- Return to sporting activity
- Full recovery may take at least twelve months

**Pre-operatively**
When practical the patient will be seen pre-operatively, and with consent, the following assessed:
- Current functional levels
- General Health
- Social / Work / Hobbies
- Functional Range of Movement
- Gait / mobility, including walking aids and orthoses
- Post-operative expectations
- Patient information leaflet issued
- Post-operative management explained

**Post-operatively**
Always check the operation notes and post-operative instructions. Discuss any deviation from routine guidelines with the team concerned.

Please ensure that you follow the correct guidelines for the operation the patient has undergone as there are subtle differences between the rehabilitation protocols for each.
Initial rehabilitation phase
0-6 weeks

Goals:
- To be safely and independently mobile with appropriate walking aid, adhering to weight bearing status
- To be independent with home exercise programme as appropriate
- To understand self-management / monitoring, e.g. skin sensation, colour, swelling, temperature etc.

Restrictions:

- **Osteotomy:**
  - In Plaster Cast (POP) for 2 weeks Non Weight Bearing (NWB)
  - Then in a removable Plaster Cast or Aircast Boot for 4 weeks NWB
  - Between 3rd to 6th weeks they can come out of the cast / boot three times per day for gentle dorsiflexion/plantarflexion Range of Movement (ROM) exercises (unless otherwise advised in the operation note). This will be at the discretion of the treating consultant.
  - The patient should be completely NWB for 6 weeks overall in this phase
  - No movement into Inversion or Eversion for 6 weeks

- **Arthroscopy:**
  - In Plaster Cast (POP) for 2 weeks Non Weight Bearing (NWB)
  - After 2 weeks will go into an Aircast Boot. They can commence Partial Weight Bearing (PWB) from week 3 in Aircast Boot
  - Between 3rd to 6th weeks they can come out of the Aircast Boot three times per day for gentle dorsiflexion/plantarflexion Range of Movement (ROM) exercises (unless otherwise advised in the operation note). This will be at the discretion of the treating consultant.
  - No movement into Inversion or Eversion for 6 weeks

- If sedentary employment, patients may be able to return to work from 4 weeks post-operatively, if there are no complications and there are provisions to elevate leg.

Treatment:
- **Pain-relief:** ensure adequate analgesia
- **Elevation:** ensure elevating leg with foot higher than waist level
- **Exercises:** teach circulatory exercises
- **Education:** teach how to monitor sensation, colour, circulation, temperature, swelling, etc. and advise what to do if concerned
- **Mobility:** ensure patient is independent with transfers and mobility, including stairs if necessary

On discharge from ward:
- Independent and safe mobilising, including stairs if appropriate
- Independent with transfers
- Independent and safe with home exercise programme / monitoring
Milestones to progress to next phase:

- Formal physiotherapy to start at 6 weeks – referral to physiotherapy from 6 week clinic appointment.
- Prior to physiotherapy, patients who have had an osteotomy must have radiographic confirmation of union (X-Ray at 6 week clinic appointment)
- Adequate analgesia.
Recovery rehabilitation phase
6 – 12 weeks

Goals:
- To be independently mobile out of POP / Aircast Boot
- To achieve full range of movement
- Optimise normal movement and gait

Restrictions:
- Progress to Full Weight Bearing (FWB) from 6 weeks
- All exercises should be pain free.
- Avoid strain / shear forces across ankle joint to avoid shear / strain on implant
- No accessory joint mobilsations to ankle joint
- No impact exercise (eg. jogging / aerobics / etc)
- Can start using exercise bike gently and swimming gently between weeks 6 and 12 as long as no aggravation of pain.

Treatment:
- Pain relief
- Advice / Education and instruction regarding restrictions and activities of daily living (avoiding activities that can provoke excessive strain / shear on the implant)
- Swelling Management
- Postural advice / education
- Mobility and gait re-education: ensure safe and independent mobilisation. Progress gait including weight-bearing and walking aids as appropriate
- Wean out of POP / Aircast Boot and into normal footwear.
- Exercises:
  - Passive range of movement (PROM)
  - Active-assisted range of movement (AAROM)
  - Controlled active range of movement (AROM)
  - Stretching of tight structures as appropriate (e.g. Achilles Tendon often tight if dorsiflexion limited pre-operatively)
  - Strengthening exercises progressing from gentle isometric to isotonic, including eccentric strengthening as able
  - Strengthening exercises of other muscle groups as appropriate, including those contributing to stabilising the foot and ankle.
  - Balance / proprioception work
  - Core stability work
  - Review lower limb biomechanics and kinetic chain. Address issues as appropriate.
- Manual Therapy:
  - Soft tissue techniques as appropriate
  - Accessory joint mobilsations as appropriate ensuring awareness of those which may not be appropriate to mobilise (see restrictions)
- Monitor sensation, swelling, colour, temperature, etc
- Orthotics if required via surgical team
- Hydrotherapy if appropriate
- Electrotherapy if appropriate
- **Pacing advice** as appropriate

**Milestones to progress to next phase:**
- Full ankle range of movement
- Mobilising independently in normal footwear as pain allows (may still require a walking aid)
- Grade 4 muscle strength (dorsiflexion / plantarflexion / inversion / eversion) on Oxford Scale

**Failure to meet milestones:**
- Refer back to team / Discuss with team
- Continue with outpatient physiotherapy if still progressing
Intermediate rehabilitation phase
12 weeks – 6 months

Goals:
- Full ROM
- Independently mobile unaided
- Grade 5 Muscle strength
- Return to low impact sports if set as patient goal

Restrictions
- All exercises should be pain free.
- No jogging until 6 months

Treatment:
Further progression of the above treatment:
- Pain relief
- Advice / Education
- Posture advice / education
- Mobility: Progression of mobility and function
- Gait re-education
- Exercises:
  - Range of movement if required
  - Progress strengthening exercises for ankle muscles
  - Progress strengthening exercises for kinetic chain
  - Core stability work
  - Stretches of tight structures as appropriate (e.g. Achilles Tendon)
  - Review lower limb biomechanics. Address issues as appropriate.
  - Core stability work
- Balance / proprioception work
  - Use of wobble boards, trampet, gym ball, Dyna-cushion etc
  - Tie in with core stability work
  - Progress from static to dynamic exercises as appropriate
- Manual Therapy:
  - Soft tissue techniques as appropriate
  - Joint mobilisations as appropriate
- Monitor sensation, swelling, colour, temperature, etc
- Orthotics if required via surgical team
- Hydrotherapy if appropriate
- Electrotherapy if appropriate
- Pacing advice as appropriate

Milestones to progress to next phase:
- Independently mobile unaided
- Full ROM
- Muscle strength: grade 5 (dorsiflexion / plantarflexion / inversion / eversion) on Oxford scale
Return to low-impact activity/sports
Have started to work on Single Leg Stance

**Failure to meet milestones:**
- Refer back to team / Discuss with team
- Continue with outpatient physiotherapy if still progressing
Final rehabilitation phase
6 months – 1 year

Goals:
- Grade 5 muscle activity throughout lower limb
- Single leg stand 30 seconds
- Return to high impact sports if set as patient goal
- Establish long term maintenance programme

Restrictions:
- All exercises should be pain free
- Return to jogging from 6 months building up to running as long as pain free, and commence sport specific training
- Return to contact sport from 1 year

Treatment:
- Mobility / function: Progression of mobility and function, increasing dynamic control with specific training to functional goals
- Gait re-education
- Exercises:
  - Sports specific/functional exercises.
  - Address any issues raised from patient after return to activity
- Functional dynamic work including running, hopping, jumping etc (depending on dynamic stability)
- Jogging to running when pain free and able to hop on affected lower limb
- Pacing advice

Milestones for discharge:
- Independently mobile unaided
- Appropriate patient-specific functional goals achieved, eg. return to sport
- Independent with long term maintenance programme
FAILURE TO PROGRESS

If a patient is failing to progress, then consider the following:

<table>
<thead>
<tr>
<th>POSSIBLE PROBLEM</th>
<th>ACTION</th>
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<tbody>
<tr>
<td>Swelling</td>
<td>Ensure elevating leg regularly</td>
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<td>Use ice as appropriate if normal skin sensation and no contraindications</td>
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<td>Decrease amount of time on feet</td>
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<td></td>
<td>Pacing</td>
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<td></td>
<td>Use walking aids</td>
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<td></td>
<td>Circulatory exercises</td>
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<td></td>
<td>If decreases overnight, monitor closely</td>
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<td></td>
<td>If does not decrease overnight, refer back to surgical team or to GP</td>
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<tr>
<td>Pain</td>
<td>Decrease activity</td>
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<td></td>
<td>Ensure adequate analgesia</td>
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<td>Elevate regularly</td>
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<td>Decrease weight bearing and use walking aids as appropriate</td>
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<td>Pacing</td>
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<td>Modify exercise programme as appropriate</td>
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<td>If persists, refer back to surgical team or to GP</td>
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<tr>
<td>Breakdown of Wound e.g.</td>
<td>Refer to surgical team or to GP</td>
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<td>inflammation, bleeding, infection</td>
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<td>Numbness / altered sensation</td>
<td>Review immediate post-operative status if possible</td>
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<td>Ensure swelling under control</td>
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<td>If new onset or increasing refer back to surgical team or GP</td>
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<td></td>
<td>If static, monitor closely, but inform surgical team and refer back if</td>
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<td>deteriorates or if concerned</td>
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Summary of evidence for physiotherapy guidelines

A comprehensive literature search was carried out to identify research relating to rehabilitation following cartilage transplantation. After reviewing the articles and information, the physiotherapy guidelines were produced on the best available evidence.


