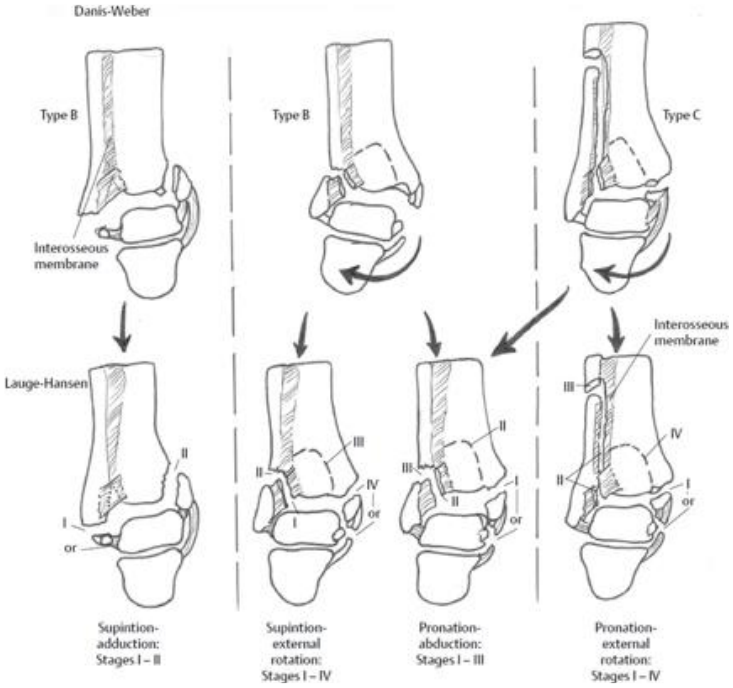
23 Distal Tibia + Ankle

PRO TIPS

- The world of Trauma Orthopaedics has recently tied itself up in knots over the management of ankle fractures. It has therefore become overly complicated and there are a lot of people talking nonsense. The key is understanding the residual soft tissues. It is worth re-visiting the structured process of assessment laid out in 04 Operative Management / How to describe and treat fractures and the sequential ligament disruption described in the Lauge-Hansen Classification. Although not perfect, this classification is far superior in terms of understanding the soft tissues than the Danis-Weber Classification.



- To better understand residual soft tissue, researchers have looked at the sensitivity and specificity of a variety of clinical and radiologic tests. If you are going to use a particular tool for assessment you should be aware of your over treatment rate (see **Abstracts + Full Text Papers** below).
- Syndesmosis fixation – 1 screw, 2 screws, 3 cortices, 4 cortices, 3.5mm, 4.5mm, 1 or 2 tightropes, FWB immediate, FWB 6 weeks, FWB 12 weeks – if there was one universally successful strategy, we would use it! The reality is they can all fail. The only successful management strategy is the one that catches failures early to allow for successful joint preserving salvage surgery. In Weber C fractures perform a clinical and x-ray review at 6 weeks post weight bearing, further review may be necessary, if in doubt.
- Iatrogenic syndesmotic mal-reduction is very common, approximately 20-30%. Get a mortise and true lateral of the contralateral ankle BEFORE you start your fixation. At the end of the operation the position of the fibula on both views should be identical.
- Operative treatment of diabetic ankle fractures has a high risk of complications (12.5%), but do not think non-operative is necessarily safer (75%), (Nonoperative Versus Operative Treatment of Displaced Ankle Fractures in Diabetics, Lovy et al, Foot + Ankle Intl 2016).

UK ISCP TRAUMA + ORTHOPAEDIC SYLLABUS

Knowledge

0 = No experience expected / 1= Has observed or knows of / 2= Can manage with assistance / 3 = Can manage whole but may need assistance / 4= Able to manage without assistance including potential common complications Green text = Oxford Trauma Service suggestions			
Topic	**CORE**	**ST3-ST8**	**>ST8**
Anatomy			
Basic Science (Regional)			

Anatomy			
Anatomy of the ankle and related structures	3	4	4
Surgical approaches: ankle	2	4	4
Surgical approach to Weber B ankle fractures	3	4	4
Biomechanics & Biomaterials			
Biomechanics of the ankle	2	4	4
Investigations			
Radiological investigations to assess ankle conditions	2	4	4
Assessments			
History and examination of the ankle including special clinical tests	3	4	4
Treatments			
Periarticular fractures around the ankle	2	4	4
Weber B ankle fractures	3	4	4
Operative			
Management of closed peri-articular fractures	2	4	4
Amputations in the ankle	2	4	4
Management of tendon (Achilles Tendon)	1	4	4
Non operative			
Footwear modifications, orthoses and total contact casting	1	4	4
Rehabilitation of the ankle	2	3	4

Technical

0 = No experience expected / 1= Has observed or knows of / 2= Can manage with assistance / 3 = Can manage whole but may need assistance / 4= Able to manage without assistance including potential common complications
Green text = Oxford Trauma Service suggestions

Topic	CORE	ST3-ST8	>ST8
Ankle			
Ankle fracture / dislocation:			
Ankle fracture / dislocation MUA & POP	3	4	4
Ankle fracture / dislocation ORIF	2	4	4
Application of spanning external fixator	1	4	4
Irrigation and debridement native joint for infection - ankle	1	4	4
Irrigation and debridement prosthesis for infection - ankle	0	2	4
Pilon fracture			
Pilon fracture ex-fix	1	4	4
Pilon fracture ORIF	0	2	4
Pilon fracture treatment with circular frame	0	2	4
Tendon			
Achilles tendon repair	1	4	4

Please find below, resources that cover the syllabus objectives.

DISCUSSION SLIDES

OTA Resident Lectures – Ankle Fractures
OTA Resident Lectures – Pilon Fractures
OTA Resident Lectures – Ligamentous & Tendon Injuries about the Ankle

RECOMMENDED KNOWLEDGE REVIEW RESOURCES

ANKLE FRACTURES

- Rockwood + Green Chapter 64a: Ankle Fractures p2822-2876
- JBJS Clinical Summary

- BOA Standard – The Management of Ankle Fractures
- Orthobullets – Ankle Fracture – Adult
- Patil - Ankle Fractures: Emerging truth from controversies, VuMedi (9.5mins)
- O'Connor - Ankle Fractures: The Struggle with Diabetes, Steroids, and Vasculopaths, VuMedi (14mins)

PILON FRACTURES
- Rockwood + Green Chapter 63a: Tibial Pilon Fractures p2752-2821
- Orthobullets – Tibial Plafond Fracture
- JBJS Clinical Summary
- Jacob – Management of High-Energy Tibial Pilon Fractures, Strat Traum Limb Recon 2015 [Full text]

ANKLE SPRAIN
- Orthobullets – Ankle Ligaments
- Orthobullets – Ankle Sprain
- Orthobullets – High Ankle Sprain
- JBJS Clinical Summary

ACHILLES TENDON RUPTURE
- Rockwood + Green Chapter XXXX p
- Orthobullets – Achilles Tendon Rupture
- JBJS Clinical Summary

SCORING / CLASSIFICATION SYSTEMS
- AO/OTA

RECOMMENDED TECHNICAL REVIEW RESOURCES

ANKLE FRACTURES
- AO Surgery Reference – Ankle – Adult
- Lannon - Surgical Approaches to the Ankle, VuMedi (23 mins)
- Gardner - The Ankle Syndesmosis: Diagnosis, Reduction and Fixation, VuMedi (16mins)
- Tan - Diabetic Ankle Fractures - Unique Fixation, VuMedi (15mins)
- Kottmeier – Posterior Malleolus Fixation, Orthobullets (7 mins)
- AIM videos
    - Introduction to AIM study
    - Methodology
    - Close Contact Cast Introduction
    - Close Contact Cast Principles
    - Close Contact Cast Preparation
    - Close Contact Cast Application

PILON FRACTURES
- AO Surgery Reference –Distal Tibia
- Ketz - Pilon Fractures, VuMedi (20mins)
- Steinlauf - Staging & Timing of Pilon Fractures, VuMedi (18mins)
- Yoon - Approaches to Treating Pilon Fractures, VuMedi (20mins) (Nice summary of approach options)
- Bates - Considerations for Internal Fixation in Distal Tibia Fractures, VuMedi (18mins)
- Clare - Management of Soft Tissue Injuries Associated with Pilon Fracture, VuMedi (5mins)
- Ketz - How to plan pilon incisions, VuMedi (12mins)
- Sems - Techniques of the Anterior Approach for Pilon Fractures, VuMedi (14mins)
- Lafferty - Techniques of the Posterior Approach for Pilon Fractures, VuMedi (14mins)
- Karam - Percutaneous Techniques for Tibial Pilon Fractures, VuMedi (16mins)
- Yoon - External Fixation and Surgical Staging for Pilon Fractures, VuMedi (11mins)

ANKLE SPRAIN

ACHILLES TENDON RUPTURE

SMITH + NEPHEW

- Product technical guides
- Trauma Education

STRYKER

- Product technical guides

DEPUY SYNTHES

- Product technical guides

ACUMED

- Fibular Rod

OPED

- VACOped application

GUIDES + PROTOCOLS

NICE (NATIONAL INSTITUTE FOR CLINICAL EXCELLENCE)

- Fractures (non-complex): assessment and management
- Osteoporosis: assessing the risk of fragility fractures (CG146)

RECOMMENDED PAPERS

Gougoulias – When is a simple fracture of the lateral malleolus not so simple, BJJ 2017 (must read!)
Assal – Strategies for Surgical Approaches in Open Reduction Internal Fixation of Pilon Fractures, JOT 2015
Elgayar – A Systemic Review Investigating the Effectiveness of Surgical Versus Conservative Management of Unstable Ankle Fractures, JoF+A 2019
Lampridis – Stability in Ankle fractures: Diagnosis and Treatment, EORT 2018
You should be aware of these outcome studies: AIM, CROSSBAT* [full text], 30 year follow-up of ankle fractures, SMART study BJJ 15, LAMP study Inj 19

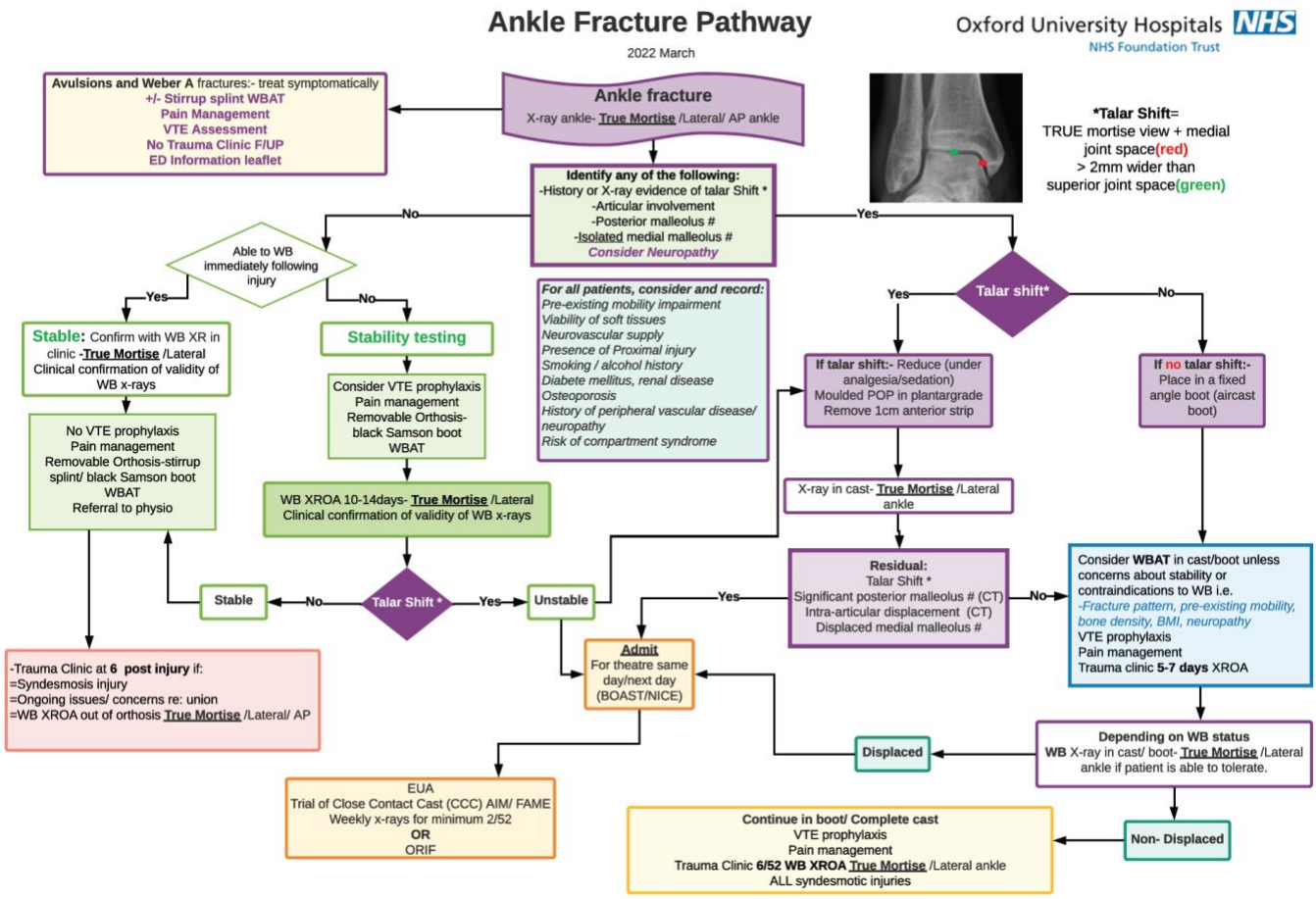
*Personal correspondence from CROSSBAT author "The other patient in the non-op group who had unplanned surgery was actually a protocol violation. He was randomised to the non-op group but the surgeon thought he needed an ORIF. That itself wasn't the unplanned surgery- it was the fact that the plate had to be removed later! Unfortunately, even though this was after an ORIF, it had to be analysed and included in the non-op according to the intention to treat principle."

OXFORD UNIVERSITY HOSPITAL NHS FOUNDATION TRUST PROTOCOLS

ANKLE FRACTURES (SEE BELOW)

ACHILLES TENDON (SEE BELOW)

ANKLE FRACTURES



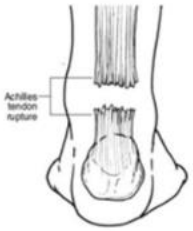
ALL ANKLE FRACTURES (OPERATIVE AND NON OPERATIVE) SHOULD HAVE A WEIGHT BEARING X-RAY OUT OF SPLINT 6 WEEKS POST FULL WEIGHT BEARING .

ACHILLES TENDON

Oxford University Hospitals NHS
NHS Foundation Trust

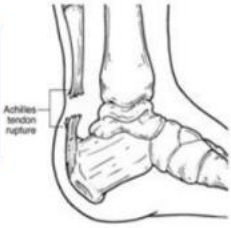
Oxford Health NHS
NHS Foundation Trust

Visual Algorithm for Achilles Tendon Ruptures (Adult 18+ only)



Patient presents to ED with ankle/calf injury with a typical mechanism i.e.

- *Forced dorsiflexion from planter flexed foot*
- *Forced push off*



Clinical examination identifies clinical suspicion

Clinical Examination

Simmonds Triad of tests:
=Palpable gap
=No Plantarflexion on calf squeeze test
=Altered angle of declination/ "dangle" *(injured side different to uninjured side when relaxed)*

https://www.youtube.com/watch?v=8PvgvUV8N8U

<2 Clinical signs
Clinical uncertainty
All other differential diagnoses ruled out

2+ Clinical Signs are positive

NO Ultrasound Scan

- **New Patient Clinic next day**
- Equinus BK backslab
- NWB, elbow crutches
- VTE assessment
- Safety netting advice
- Discharge ED

BOOK URGENT
Morning Ultrasound Scan (within 72hrs)

- **New Patient Clinic after USS**
- Equinus BK backslab
- NWB, elbow crutches
- VTE assessment
- Safety netting advice
- Discharge ED

If there is **no slot available within 72hrs, contact the MSK radiologist on **22910**, **Mon-Fri** to request an overbooking.*
If at the **weekend there are no slots available on the following Mon-Wed, you may overbook a Mon slot without prior confirmation.*
*If **midweek and OOH**, discuss with the MSK consultant on-duty the following day, then phone the patient with the appointment slot once approved.*

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Achilles Tendon Rupture Protocol

Non-operative / Percutaneous repair

VACOped Boot: *Patients to be given information leaflet with fitting advice, importance of skin checks and links to accessories i.e. shower protector, Even-Up shoe or rain protector. Wedge sole can be removed at night for hygiene purposes.*

Delayed presentations:

To trial TA Protocol and if ongoing functional limitations at 3 months, consider repair

Partial ruptures:

Can be treated as per Week 4-6 from day 1 depending on clinical presentation and percentage of tendon integrity

Week 0-4

-WBAT with elbow crutches

-VACOped boot locked at 30 deg Plantarflexion with wedge sole attachment

-VTE prophylaxis

-Referral to physiotherapy to start at week 4

-Removal of boot for dressing, skin/wound care only:- **not to dorsiflex foot**

-Review in follow-up clinic in **4 weeks**

Week 4-6

-Review in follow-up clinic for VACOped boot dynamic angle adjustment

-**Discharge to physio** if no clinical concerns *(Delayed presentation-review at 3 months)*

-WBAT with elbow crutches

-VACOped boot dynamic angle to be set at 15-30 deg Plantarflexion with wedge sole attachment

-Stop VTE prophylaxis unless any clinical concerns/risk factors

-Removal of boot for dressing, skin care, exercises and at night only

Physiotherapy Advice
• Start regular non-weight bearing ankle range of movement exercises 4x a day • Specific soft tissue mobilisation to calf muscle and tendon if indicated

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Achilles Tendon Rupture Protocol

Non-operative / Percutaneous repair

Week 6-8

-WBAT

-VACOped boot dynamic angle to be set at 0-30 deg Plantarflexion with flat sole attachment +/- elbow crutches

-Removal of boot for dressing, skin care, exercises and at night only

Physiotherapy Advice
• Continue ankle range of movement exercises • Passive dorsiflexion stretches- PWB in sitting • Toe and heel raises in sitting • Progress to: Dorsiflexion stretches in standing • Progress to: Heel raises in standing (injured/non injured- 20/80%, 50/50%)

Week 8-12

-WBAT

-Wean out of the VACOped boot at 8 weeks if:

- Full active range of movement
- MM 4/5 plantarflexion strength
- No palpable gap

-Education re: re-rupture risk at 10-12 weeks

-**Avoid** extreme dorsiflexion of the ankle combined with active plantar flexion, running, jumping or hopping, eccentric lowering exercises used in tendinopathies

Physiotherapy Advice
• Proprioceptive exercises • Dorsiflexion stretches in standing • Heel raises in standing (injured/non injured- 50/50%, 60/40% etc.)

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Achilles Tendon Rupture Protocol

Non-operative / Percutaneous repair

Month 3-6

-**Review in follow-up clinic** for those with delayed presentations at **3 months** post injury to assess response to rehabilitation

Physiotherapy Advice
• Gradually progress to single heel raises if adequate strength and flexibility • Dynamic proprioceptive exercises • Plyometric exercises- jogging on trampette, bunny hops etc. • Jogging on the flat at around 5 months depending on strength/endurance

6 Months onwards

Physiotherapy Advice
• Sport specific exercises to facilitate a return to higher impact sports that involve sprinting, lunging and jumping, such as football, squash or tennis • Consider psychological factors in return to play

RETURN TO SPORT

Physiotherapy Advice
• **Do not return to sport until:** -Able to complete single heel raise -Able to sprint with toe off phase -Horizontal single leg hop x 3 at least 75% of the uninjured leg -Vertical hop is at least 75% of the uninjured leg

Note: The above physiotherapy advice is a guide only. Use your clinical judgement to progress to each stage depending on pain, flexibility and strength.

July 2019

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