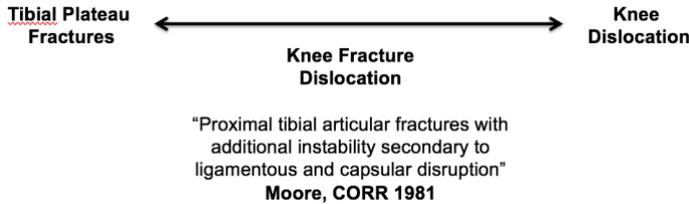


22 Knee and Proximal Tibia – adult

PRO TIPS

- Consider knee injuries as part of a spectrum of bone and soft tissue injury.



- Remain alert to associated vascular injury in every knee injury.
- Do not trust the vascular surgeons to do the right thing at any stage!
 - Acute ischaemia should not be treated the same as chronic ischaemia. Collateral blood flow will never be sufficient.
 - A vascular reconstruction will always take longer than they say.
 - Perform fasciotomies as the first procedure
 - The top end of the medial fasciotomy incision is how they will access the tibial vessels.
 - Collateral flow during re-vascularisation will minimise effect of ischaemia.
 - Almost always needed following re-perfusion.
 - Insist they use a shunt.
 - Do not let them detach the head of medial gastroc if there is a possibility of needing a local flap.
- When planning fixation, consider optimum implant configuration based on fracture pattern before choosing approach.
- Fix the column that gives you the best cortical read first and consider using 'defeatable' fixation, to avoid uncorrectable over reduction.
- If the tibial plateau looks wider than the femoral condyles, it is not reduced.
- The lateral tibial plateau can tolerate central articular deficits as long as the meniscus is intact and the rim reduced. Medial tibial plateaus tolerate incongruity poorly so must be perfect.
- The back of the knee is only 'tiger country' if you are unsuited to a career in surgery.

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
Knowledge			
Basic Science (Regional)			
Anatomy			
Anatomy of the knee joint and related structures	3	4	4
Surgical approaches to the knee and arthroscopic access	2	4	4
Pathology			
Instability of the knee, including the patellofemoral joint	2	4	4
Biomechanics & Biomaterials			
Biomechanics of the knee	1	4	4
Investigations			
Radiological investigation to assess the knee	3	4	4
Critical Conditions			
Neurovascular injuries	3	4	4
Assessments			
History and examination of the knee joint including special clinical tests	3	4	4

Treatments			
Periarticular fractures around the knee	2	4	4
Operative			
Management of closed peri-articular fractures	2	4	4
Meniscal pathology	2	4	4
Management of tendon, ligament and nerve injuries	1	4	4
Amputation	2	4	4
Non operative			
Orthoses	1	4	4
Rehabilitation of the knee	1	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
Acute arthroscopy for knee trauma	0	3	4
Application of spanning external fixator	0	4	4
Knee MUA +/- POP	2	4	4
Patella fracture			
Patella dislocation closed reduction +/- open repair	1	4	4
Patella fracture ORIF	0	4	4
Patellectomy	0	4	4
Soft tissue repair			
Acute ligament repair	0	3	4
Patella tendon repair	0	4	4
Quadriceps tendon repair	0	4	4
Tibial plateau fracture			
Repair of tibial spine	0	3	4
Tibial plateau fracture arthroscopically assisted fixation	0	2	4
Tibial plateau fracture ORIF with plates & screws	0	4	4
Tibial plateau fracture treatment with circular frame	0	2	4

Please find below, resources that cover the syllabus objectives.

DISCUSSION SLIDES

OTA Resident Lectures – [Knee Dislocations](#)

OTA Resident Lectures – [Patella Fractures and Extensor Mechanism Injuries](#)

OTA Resident Lectures – [Tibial Plateau Fractures](#)

RECOMMENDED KNOWLEDGE REVIEW RESOURCES

PATELLAR FRACTURES + EXTENSOR MECHANISM INJURIES

- Rockwood + Green Chapter 59a: Patellar Fractures and Dislocations and Extensor Mechanism Injuries p2537-2573
- Orthobullets – [Patellar Fracture](#)
- Orthobullets – [Patellar Sleeve Fracture](#)
- Orthobullets – [Bipartite Patella](#)
- Orthobullets – [Patello Femoral Joint](#)
- Orthobullets – [Quadriceps Tendon Rupture](#)

KNEE DISLOCATIONS

- Rockwood + Green Chapter 60a: Knee Dislocations p2574-2622
- JBJS Clinical Summary – [Knee Dislocation](#)
- Orthobullets – [Knee Dislocation](#), [ACL Injury](#), [PCL Injury](#), [LCL Injury](#), [MCL Injury](#), [Postero-lateral Corner](#)

TIBIAL PLATEAU FRACTURES

- Rockwood + Green Chapter 61a: Tibial Plateau Fractures p2623-2686
- Orthobullets – [Tibial Plateau Fractures](#)
- JBJS Clinical Summary – [Tibial Plateau Fractures](#)
- VuMedi – [High Energy Tibial Plateau Fractures](#), 2017 (15 mins)
- Smith + Nephew – [Tibial Plateau Anatomy](#)
- (Review paper) Name – Title with Hyperlink to PubMed, Journal XXXX [Abstract]
- (On-line video) Name – Title, Resource ‘4 figure year’ (XX mins)

PROXIMAL TIB-FIB DISLOCATION

- Orthobullets – [Proximal tib fib dislocation](#)

SCORING / CLASSIFICATION SYSTEMS

- [AO/OTA](#)

RECOMMENDED TECHNICAL REVIEW RESOURCES

PATELLAR FRACTURES + EXTENSOR MECHANISM INJURY

- AO Surgery Reference – [Patella](#)
- Orthobullets – [Patellar tendon repair](#)
- Orthobullets – [Quadriceps Tendon Repair](#)

KNEE DISLOCATION

- AO Surgery Reference – [Title](#)
- Orthobullets – [Title](#)

TIBIAL PLATEAU FRACTURES

- AO Surgery Reference – [Proximal Tibia](#)
- Smith + Nephew – [Strategies for Managing Complex Proximal Tibial Fractures](#)
- Smith + Nephew – [Tibial Plateau Planning](#)
- Smith + Nephew – [Superficial Dissection](#)
- Smith + Nephew – [Deep Dissection](#)
- Smith + Nephew – [Alternative Approach](#)
- Smith + Nephew – [ORIF Posteromedial Tibial Plateau](#)
- Smith + Nephew – [ORIF Lateral Tibial Plateau](#)
- VuMedi – [Direct Posterior Approach to Posteromedial Tibial Plateau Fractures](#)
- VuMedi – [Posterolateral Approach Without Fibular Osteotomy](#)
- VuMedi – [Shatzker 3 Using Anteromedial Bone Tamp](#)
- VuMedi – [Bicondylar Tibial Plateau ORIF](#)

SMITH + NEPHEW

- [EVOS small](#)
- [Trauma Education](#)

STRYKER

- [Hoffman 3](#) – NB details about frame configuration and MRI compatibility

DEPUY SYNTHES

- [Product technical guides](#)

GUIDES + PROTOCOLS

BOA (BRITISH ORTHOPAEDIC ASSOCIATION)

- BOA Standards for Trauma – [Peripheral Nerve Injury](#)
- BOA Standards for Trauma – [Arterial Injury with Fractures and Dislocations](#)
- BOA Standards for Trauma – [Compartment Syndrome](#)

NICE (NATIONAL INSTITUTE FOR CLINICAL EXCELLENCE)

- [Trauma \(QS166\)](#)
- [Major trauma: service delivery \(NG40\)](#)
- [Major trauma: assessment and initial management \(NG39\)](#)
- [Fractures \(complex\): assessment and management \(NG37\)](#)
- [Fractures \(non-complex\): assessment and management \(NG38\)](#)

AUTHORS PREFERRED PROTOCOLS

- [Dysvascular limb](#)
- [Compartment Syndrome](#)

- [Critical Decision Making](#)

ABSTRACTS + FULL TEXT PAPERS

ASSESSMENT

Classification

- Zhu - [Computed tomography-based Three-Column Classification in tibial plateau fractures: introduction of its utility and assessment of its reproducibility](#), J Trauma Acute Care Surg, 2012
- Anwar – [Two column classification of tibial plateau fractures; description, clinical application and reliability](#), Inj 2019

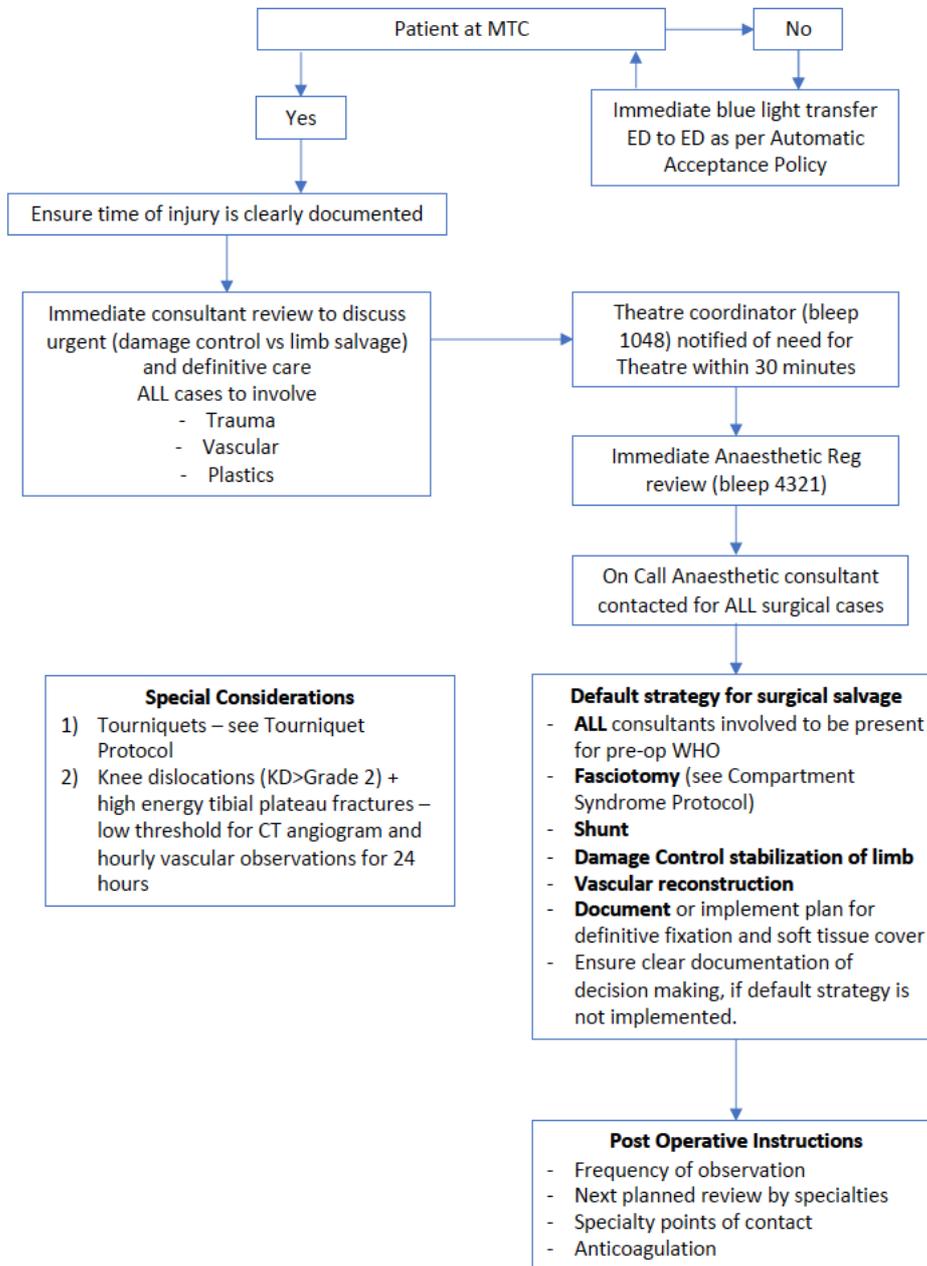
OUTCOME

- [Long-term Outcomes After Open Reduction and Internal Fixation of Bicondylar Tibial Plateau Fractures](#), JOT 01
- [Risk Factors for Knee Stiffness Surgery After Tibial Plateau Fracture Fixation](#), JOT 18
- [Patient-reported Quality of Life and Pain After Permissive Weight Bearing in Surgically Treated Trauma Patients With Tibial Plateau Fractures: A Retrospective Cohort Study](#), Arch Orthop Trauma Surg 19

PROTOCOLS

DYSVASCULAR LIMB

Acute Traumatic Dysvascular Limb Protocol



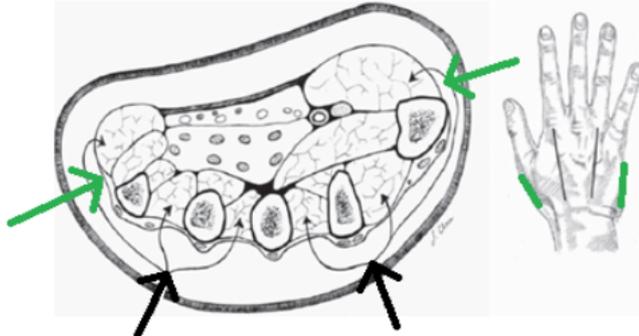
COMPARTMENT SYNDROME

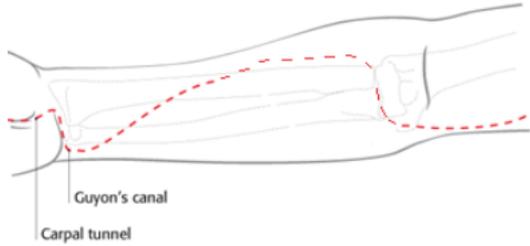
High Clinical Suspicion - Mechanism	<ul style="list-style-type: none"> - Young males with injury to lower leg or forearm - Altered sensorium (obtunded or regional anaesthesia) - Hypotensive patient - Anticoagulated patients <p><u>Intrinsic Causes</u></p> <ul style="list-style-type: none"> - Fractures - Crush injuries - Vascular injury and re-perfusion swelling - Fluid extravasation / injection into soft tissues - History of prolonged external contact pressure (eg operative limb positioning / IVDU overdose) - Burn <p><u>Extrinsic Causes</u></p> <ul style="list-style-type: none"> - Tight dressing / cast
<u>PATHOLOGICAL</u> Definition	<ul style="list-style-type: none"> - Raised pressure within a closed compartment (intrinsic / extrinsic) resulting in tissue ischaemia and if untreated, necrosis.
<u>CLINICAL</u> Definition	<ul style="list-style-type: none"> - Tense compartment - Out of proportion pain refractory to appropriate analgesia - Pain exacerbated by passive stretch of affected muscle group - LOSS OF PULSE and NEUROLOGIC CHANGES ARE LATE signs. Treatment should be initiated before these findings become evident.
<u>DIAGNOSTIC</u> Definition	<ul style="list-style-type: none"> - Direct compartment pressure (compared against diastolic BP) <ul style="list-style-type: none"> o using dedicated measurement device o central line pressure transducer <ul style="list-style-type: none"> ▪ use 'orange' or 'grey' cannula ▪ flush through ▪ zero at level of limb to be measured ▪ insert cannula into compartment ▪ flush through ▪ wait for pressure measurement to stabilise ▪ repeat for all affected compartments - Compartment Pressure >30mmHg or within 30mmHg of diastolic blood pressure (whichever is lower)
Initial Treatment of <u>Suspected</u> AND <u>Confirmed</u> Compartment Syndrome	<ul style="list-style-type: none"> - Ensure extrinsic causes have been resolved. - Maintain some form of effective splintage to manage pain relief. - Elevate FULLY supported at level of heart with downstream gradient between digits and shoulder/hip - Adequate opiate analgesia, administered in 10mg boluses (lower doses to be considered in children, elderly and renal impairment). Boluses should be given at short intervals. - Supplemental high flow oxygen - Nil by mouth and maintenance IV fluids

Surgical – Emergency Decompression	<ul style="list-style-type: none"> - Full length skin and fascial incisions should be used to ensure ALL affected compartments are adequately decompressed. - See Fasciotomy Diagrams below. - Burns <ul style="list-style-type: none"> o Manage with standard escharotomies, dressings and fluid resuscitation
Surgical – Closure	<ul style="list-style-type: none"> - In the presence of underlying fixation. Soft tissue coverage should not be delayed. - In the absence of underlying fixation, no attempt should be made to close before 48hrs. <ul style="list-style-type: none"> o Fasciotomy wounds for significant compartment syndrome frequently need split skin graft coverage and this should be considered at 48hrs. Routine use of incremental closure with repeat theatre visits is not recommended in the BOA/BAPRAS guidelines. o Negative Pressure Wound Therapy (NPWT) should be considered as an adjunct for wound dressings, closure and use over split skin grafts.
Special Considerations	
Associated Fracture	<p>Skin incisions used for decompression should allow appropriate internal fixation. Primary closure will not be possible at the 1st procedure. Consideration should be given to the following treatment options.</p> <ul style="list-style-type: none"> - Compartment decompression followed by temporary external fixation of fracture. Patient should then be transferred to facility with appropriate access to simultaneous orthopaedic and plastic surgery capability for definitive fixation and soft tissue cover at the earliest available opportunity. Transfer should occur within 48hrs. - If plastic surgery capability is available at the time of decompression, consideration can be given to definitive fixation and split skin graft coverage at the same sitting. <p>NPWT or occlusive dressings should be used to minimise risk of hospital acquired infection, until soft tissue and skin coverage achieved.</p> <p>Antibiotics should be administered until 24-48hrs following soft tissue and skin coverage (see TVTN Open Fracture Protocol for antibiotics and doses).</p>

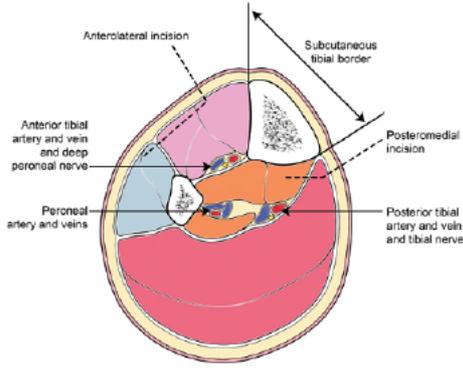
Late Presentation	<p>It is often difficult to determine the exact timeline in the development of compartment syndrome. However compartment decompression should NOT be performed in the presence of significant necrotic muscle. Fasciotomies under this circumstance is associated with a VERY HIGH rate of MORBIDITY (amputation) and MORTALITY.</p> <p>Effective treatment will require an extension of the 'Initial Treatment' described above and additional.</p> <ul style="list-style-type: none"> - Critical Care support - Increased fluid replacement to ensure adequate diuresis - Daily monitoring of CK and renal function - Likely implementation of dialysis - Physiotherapy and splinting to minimise effect of contracture formation <p>Acceptable outcomes can be achieved with this strategy</p>
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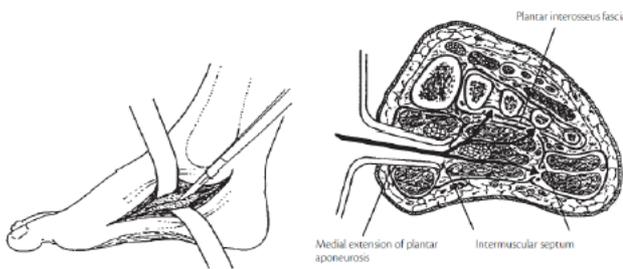
Fasciotomy Diagrams

Hand	 <p>2 dorsal incisions placed over 2nd and 4th metacarpals. Additional incisions in the axis of the 1st and 5th MC can be considered to allow easier decompression of the thenar and hypothenar muscle compartments.</p> <p>Finger fasciotomies are performed using mid axial longitudinal incisions along the non-dominant side of the digit.</p>
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Upper Limb	 <p>Standard distal incision to allow access to carpal tunnel, Guyon's canal. In addition it is better for skin grafting if primary closure is not possible. It can be extended medially to de-compress the arm. The incision can be modified to accommodate a volar approach to the radius if there is an underlying fracture requiring fixation. The extensor compartment and mobile wad can be decompressed with a straight longitudinal incision over these compartments.</p>
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Buttock + Thigh	<p>Kocher Langenbeck extending down to knee with full length split in gluteal fascia and iliotibial band. NB Inferior gluteal neurovascular bundle within substance of gluteus maximus 10cm from PSIS. The extensors and flexors can be decompressed through this incision. NB Do not enter flexor compartment through the linea aspera as this will damage the perforators. An additional medial longitudinal incision can be used to decompress hip adductors.</p>
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Leg	 <p>Use 2 incision, 4 compartment decompression as per BOA / BAPRAS guidelines. MARK BOTH INCISIONS BEFORE MAKING 1st INCISION. Postero-</p>
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Foot	 <p>Prior to fasciotomy consideration should be given to future surgical intervention. There are occasions when it may be appropriate to consider managing foot compartment syndrome non-operatively. Discussion with the surgeons who will perform definitive care is recommended prior to decompression.</p>
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Major Trauma MDT Critical Decision Protocol

