

3d advanced course on knee surgery
Val d'Isère 2010

Clinical examination in proximal articular tibia fractures.



Centre Médical Olympique Luxembourgeois

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Fracture-dislocations



Dislocation at accident:
High-energy trauma; rotation & shear forces

Highly unstable

High incidence of neurovascular and associated ligamentous injuries

TM Moore, CORR 1981

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Clinical examination



- Medical history:
High vs. low-energy trauma
- Vascular status
- Neurological status
Peroneal nerve
- Soft-tissue status
Open
Closed
Compartment syndrome
- Ligament status
After fracture stabilization ?

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Medical history

Co-morbidity:
Impaired vascularity:
Diabetes; smokers; chronic vascular disease

Cardiac or pulmonar problems

Psychiatric problems

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Emergency operation

- Compartment syndrome
- Vascular / neurologic injury
- Open fracture
- Major instability

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Vascular status



- Palpation
- Doppler Ultrasound
- Angiography

Whiteside TE J Am Acad Orthop Surg 1996

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Vascular status



- Coolness
- Pallor
- Cyanosis
- Delayed capillary refill
- Poor pulses
- Reduced ABI

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Vascular status

The Journal of TRAUMA® Injury, Infection, and Critical Care

The Value of the Ankle–Brachial Index for Diagnosing Arterial Injury After Knee Dislocation: A Prospective Study

William J. Mills, MD, David P. Barci, MD, FRCSC(C), and Patrick McNair, MD

Background: The risk of arterial injury with knee dislocation is well known. The most effective method for rapidly and accurately assessing vascular status after knee dislocation remains a topic of debate. Both physical examination and arteriography have been proposed as methods to evaluate these methods has its critics. The authors propose that the ankle-brachial index (ABI) can be used to quickly assess patients with knee dislocations who have sustained vascular injury.

Methods: A prospective study enrolled 38 patients with knee dislocation to evaluate for potential arterial injury using clinical pulse examination and ABI. Patients with an ABI lower than 0.90 underwent serial clinical examination and if 0.90 or higher were immobilized and admitted for serial examination and delayed arteriography.

Results: Of the 38 patients, 11 (29%) had an ABI lower than 0.90. All 11 had an ABI of 0.80 or lower at the time of initial assessment. The remaining 27 patients had an ABI of 0.90 or higher. None had vascular injury detectable by serial clinical examination or duplex ultrasonography. The

sensitivity, specificity, and positive predictive value of an ABI lower than 0.90 were 100%, 100%, and 100% respectively. The negative predictive value of an ABI greater than 0.90 was 100%.

Conclusion: The ABI is a rapid, reliable, noninvasive tool for evaluating vascular injury associated with knee dislocation. Routine arteriography for all patients with knee dislocation is not supported.

Key Words: Ankle-brachial index, ABI, Knee dislocation, Vascular injury, Arteriography.

J Trauma. 2003;55:1261–1265

ABI > 0,90: no vascular injury
ABI < 0,90: Possible vascular injury

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Vascular status

The Journal of TRAUMA® Injury, Infection, and Critical Care

The Role of Arteriography in Assessing Popliteal Artery Injury in Knee Dislocations

Erik O. Klineberg, MS, Brian M. Crites, MD, William R. Flinn, MD, Jason D. Archibald, MD, and Claude T. Moorman III, MD

Background: This study aimed to review the need for angiography among patients with traumatic knee dislocation and to evaluate any adverse consequences associated with the decision to pursue or defer angiography.

Methods: A retrospective analysis was performed on 67 knees of 67 patients with traumatic knee dislocation during a 7-year period. The presence or absence of arterial injury was determined by physical examination (to determine presence of foot pulses) and ankle-brachial index (≥ 0.80) and, in selected cases, by angiography.

Results: Of the vascular examination, 32 knees (46%) were found to be normal. Of the 35 abnormal examinations, 27 were due to arterial thrombosis. None of the 32 knees with normal examination results had substantial vascular injury. Seven patients (10%) had an initial normal vascular examination result that reappeared to be abnormal either by angiography or by clinical follow-up assessment in 13 cases (39%). All 25 patients with abnormal vascular examination results underwent angiography, with 12 patients (48%) demonstrating vascular injury (7 major and 8 minor injury). Seven patients with vascular injury (10% with arterial injury) underwent surgical repair with reverse saphenous vein grafting.

Conclusion: Although initial normal vascular examination results was found to have a vascular injury that reappeared later, angiography or duplex ultrasonography may not be necessary for all patients with knee dislocation. Clinical examination, vascular status, Popliteal artery, *J Trauma.* 2002;52:786–790.

No vascular lesion if ABI > 0,90 AND presence of normal foot pulses

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Vascular status

ABI > 0,9 (0,8)

- Normal vascularisation
- Arteriogram not needed
- Repeat exam several times during first days
 - Intimal tears can manifest late
 - Thrombosis

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Vascular status



Pulseless foot

- Immediate surgery
- Revascularisation
- No time waste with arteriogram
- CT angiogram ?

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Vascular status

Vascular lesion

- Amputation rate – revascularisation

< 6 hours:	6 %
< 8 hours:	11 %
> 8 hours:	86 %

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Neuro. status



- Sensitivity
- Motricity
- Peroneal nerve
- DD compartment syndrome

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Peroneal nerve lesion



- Posterolateral ligament injuries (15-30 %)
- < 30 % recover
- 45 % probability to have associated tibial nerve injury.
- if complete disruption consider early nerve transfer

Fanelli GC, 1995; LaPrade RF, 1997
Christel P, 2007

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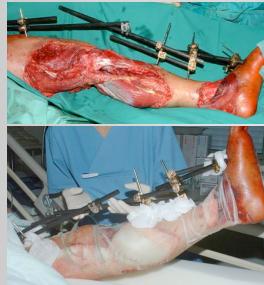
Soft-tissue status



- Open
 - Gustilo classification
 - Tscherne class.
- Closed
- Compartment syndrome

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Open fracture



- Debridement
- Jet-lavage
- Minimal fixation
- VACuum closure

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Compartment syndrome



- Compartment pressure
- Diastolic blood pressure
- Dermatofasciotomy if $\Delta p < 30$ mm Hg

Whitesides TE J Am Acad Orthop Surg 1996

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Compartment syndrome



Compartment syndrome in 414 tibia fractures:

- Proximal: 1,6 %
- Shaft: 8,1 %
- Distal: 1,4 %

Park S, J Orthop Trauma 2009

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Compartment syndrome

- Fasciotomy of 4 compartments
- Gross fracture reposition
- VACuum closure

Ligament status

- Exam under anesthesia
- Before / after fracture stabilization
- If in doubt intraop stress x-ray

Postop.

5 months