



Detection of vascular Injury In Knee Dislocation: Risk Factors, Diagnostic Tools and Timing

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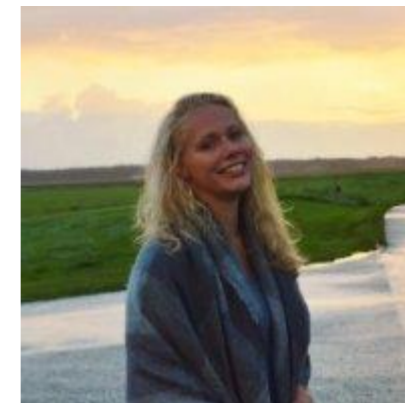


Disclosures

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Have no financial conflicts to disclose

Known Risk Factors For Vascular Injury

- ⊙ Hard signs of ischemia
- ⊙ Irreducible knee dislocation
- ⊙ Presence of nerve lesions
- ⊙ Injuries involving the lateral side of the knee
- ⊙ Bicruciate and posterolateral lesion
- ⊙ Bicruciate lesion with additional fracture
- ⊙ High-energy injuries
- ⊙ **Ultra-low energy injuries !**



CTA has the highest Sensitivity/Specificity of diagnostic interventions

Ref.	Test	N	Sensitivity /specificity
Barnes	Distal pulsations	284	79/91
Lustig	Distal pulsations	67	89/100
Boisrenoult	Distal pulsations	67	89/100
Stannard	Serial distal pulsations	126	100/99
Mills	Ankle Brachial Index	38/38	100/not tested
Boisrenoult	CTA	67	100/100



64 patients treated at 2 major trauma centers in the Netherlands were evaluated on treatment and outcome in relation to vascular injury.



Data:

Patients	Total	Vascular injury	Nerve injury
Number of patients (N)	64	10	17
Age in years, median (range)	27 (14-93)	24 (16-61)	30 (17-61)
Sex (male/female)	48/16	7/3	15/2
Side (left/right)	35/29	6/4	10/7
Mechanism, N (%)			
High-energy trauma	33	7 (21%)	10 (30%)
Low-energy trauma	24	1 (4%)	2 (8%)
Ultra-low-energy trauma	5	2 (40%)	4 (80%)
unknown	2	0	1 (50%)
Schenck classification (N)			
KD-I	30	0	6 (20%)
KD-II	0	0	0
KD-III L	10	4 (40%)	6 (60%)
KD III M	6	1 (16%)	0
KD-IV	1	0	0
KD-V	17	5 (30%)	5 (30%)
BMI, mean (range)	26.9 (17.4-40.8)	27.2 (17.4- 37.0)	27.0 (20.4-37.0)

Energy level and concomittant injury:

◎ High-energy injuries

- 21% vascular injuries
- 30% nerve injuries.

◎ Low-energy knee injuries

- 4% vascular injury
- 8% nerve injury.

◎ Ultra-low-energy & Morbidly obese

- 40% vascular injury
- 80% nerve injury.



Time interval to diagnosis and diagnostic procedure

Time interval	Physical examination	Doppler/ duplex	Imaging technique	Diagnosis
>3	Hard sign	not perf.	not perf.	Popliteal artery intimal lesion
4	Hard sign	nor perf.	CA	Popliteal artery dissection
>7	Hard sign	positive	CA	Popliteal artery dissection
9.5	Hard sign	positive	CA + CTA	Tibial and peroneal artery occlusion
6-12	Hard sign	nor perf.	not perf.	Hematoma, thrombus
6-12	Hard sign	positive	CTA	Popliteal artery transection
10	No sign	not perf.	CTA	Dissection near bifurcation, anterior tibial artery
>12	No sign, hard sign developed > 24 hours	not rep.	not perf.	Popliteal artery occlusion
21	Hard sign > 24 hours during ligament reconstruction	positive	CA	Popliteal artery dissection
34	No sign at admittance, hard sign > 24 hours	positive	CTA	Popliteal artery occlusion

10 Patients Needing Vascular Reconstruction:

- ◎ **Hard signs** of acute vascular compromise
 - Six out of 10 patients needing vascular construction
- ◎ **No clinical sign of vascular injury**
 - Three patients: two developed hard signs after 24 hours
 - One patient was diagnosed after CTA
 - One patient developed acute limb ischemia during ligamentous reconstruction, two days after the injury



Time interval, diagnosis and outcome:

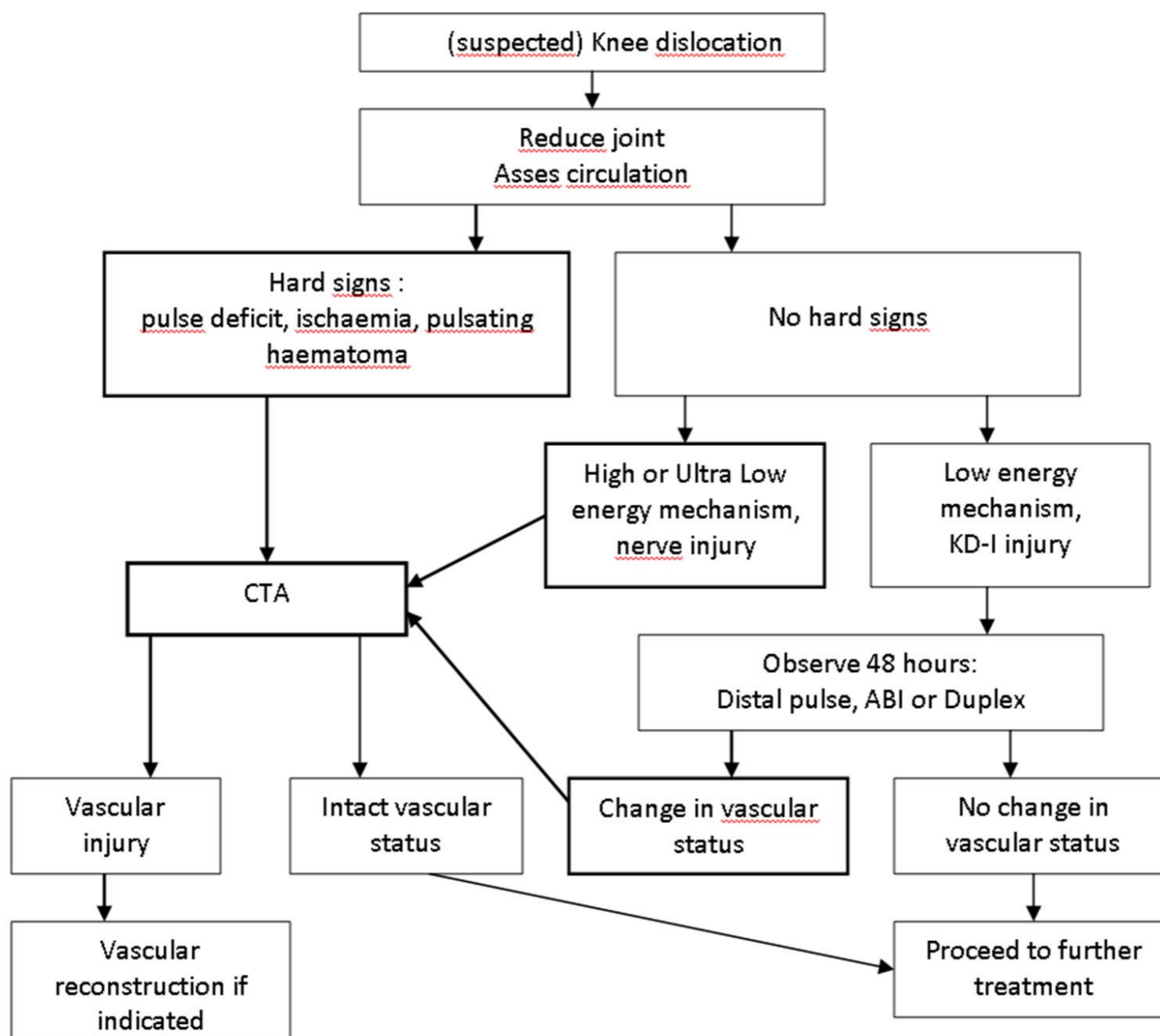
Time interval	Physical examination and diagnosis	Outcome (vascular)
>3	Hard sign, Popliteal artery intimal lesion	Intact limb. Normal vascularisation
4	Hard sign, Popliteal artery dissection	Intact limb. Normal vascularisation
>7	Hard sign, Popliteal artery dissection	Intact limb. Normal vascularisation
9.5	Hard sign, Tibial and peroneal artery occlusion	Intact limb. Normal vascularisation
6-12	Hard sign, Hematoma, thrombus	Intact limb. Normal vascularisation
6-12	Hard sign, Popliteal artery transection	Intact limb. Normal vascularisation
10	No sign, CTA positive, Dissection near bifurcation, anterior tibial artery	Intact limb. Normal vascularisation
>12	No sign, hard sign developed > 24 hours, Popliteal artery occlusion	Intact limb. Normal vascularisation
21	Hard sign > 24 hours during ligament reconstruction, Popliteal artery dissection	Intact limb. Normal vascularisation
34	No sign at admittance, hard sign > 24 hours, Popliteal artery occlusion	Intact limb. Normal vascularisation

Timing of vascular reconstruction

- ⦿ Although the optimal time window of 8 hours post-injury as described by Green was not adhered to in 60% of the cases , all vascular reconstructions were successful, no amputation had to be performed.
- ⦿ Patients with acute vascular injury did not have any increased risk of further complications compared with the non-vascular injury patients.



Diagnostic algorithm



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