

Controversies and problems in surgery 2017 S.C Tsotetsi



Introduction

- Acute Vs Chronic limb ischaemia
- prompt recognition and diagnosis, followed by rapid restoration of blood flow to the ischemic extremity to minimize risk of limb loss and subsequent reperfusionrelated local and remote organ injury.
- most often occurs in aged patients, who often have significant comorbidities, and can lead to their demise even after successful
- revascularization of a limb
- Litigation





Box 1. Common causes of embolism and thrombosis in acute limb ischemia.

Embolism

- Atherosclerotic heart disease
 - Acute myocardial infarction, left ventricle aneurysm
- = Arrhythmia (atrial fibrillation)
- Valvular heart disease
 - Rheumatic, degenerative, congenital, bacterial, prosthetic
- Artery-to-artery
 - Aneurysm (popliteal), atherosclerotic plaque
- = Idiopathic
- latrogenic
- Paradoxical embolus
- Trauma
- Other
 - Air, amniotic fluid, fat, tumor, drugs

Thrombosis

- Atherosclerosis and arterial plaque rupture
- Low-flow states
 - Congestive heart failure, hypotension, systemic shock
- Hypercoagulable states
- Vascular grafts
 - Disease progression, intimal hyperplasia, mechanical
- Trauma
- Dissection
- = External compression (popliteal entrapment or adventitial cyst with thrombosis)
- latrogenic
- Vasospasm with thrombosis (ergotism)
- Arteritis or HIV arteriopathy with thrombosis

Data taken from [15]

Phlegmasia cerulia dolens



Cardiac sources of emboli





Table 1. Differentiating embolic versus thrombotic acute limb ischemia.					
Embolic	Thrombotic				
History					
Sudden onset, severe	Vague, progressive onset, less severe				
Cardiac history	No recent cardiac events				
No peripheral arterial disease	History of peripheral arterial disease symptoms				
No prior vascular surgery	Often history of surgical or catheter-based interventions				
Physical exam					
Arrhythmia	No arrhythmia				
Severe signs of ischemia	Less severe signs of ischemia				
Cold and mottled	Cool and cyanotic				
May have normal contralateral limb without signs of chronic limb ischemia	Abnormal contralateral limb pulses often with signs of chronic limb ischemia				
Clear demarcation	No distinct demarcation				
Data taken from [13].					



Figure 2. A thrombotic occlusion, with abundant collaterals, at the site of a previously placed stent graft (A); versus an embolic occlusion with a filling defect and a paucity of collaterals (B).

Symptoms and signs

- 6 P's
- Pain
- Pallor
- Pulselesness
- Paresthesia
- Paralysis
- poikilothermia

Stages of Acute Limb Ischemia

Stage	Description and Prognosis	Findings		Doppler Signal	
		Sensory Loss	Muscle Weakness	Arterial	Venous
Î	Limb viable, not immediately threatened	None	None	Audible	Audible
I	Limb threatened				
lla	Marginally threatened, salvageable if	Minimal (toes) or none	None	Often inaudible	Audible
llb	Immediately threatened, salvageable with immediate revascularization	More than toes, associated	Mild or moderate	Usually inaudible	Audible
ш	Limb irreversibly damaged, major tissue loss or permanent nerve damage inevitable	Profound, anesthetic	Profound, paralysis (rigor)	Inaudible	Inaudible



Acute limb Ischaemia

Management

Recognize

Start unfractionated heparin

- Loading dose 75 100 IU/Kg (approximately 5000 IU)
- Followed Infusion of heparin -18U/kg (approximately -1000U/hr)
- Refer to vascular surgeon
- Pain relief
- Keep fasting
- Inform theatre and anaesthetist
- Consent for embolectomy and fasciotomy
- Check the Viability of the limb note.

Investigations

Doppler Ultrasonography

- Detection of blood velocity using ultrasonography
- Normal is triphasic: peak in systole, reversal of flow in early diastole and forward diastolic flow
- Earliest change: loss of reversal of flow so biphasic
- As obstruction increases widening of diastolic peak occurs and flow monophasic

Duplex Ultrasonography

- B mode imaging information about vessel wall and peak systolic velocity (PSV)
- Ratio of PSV at stenosis to proximal segment of 2 denotes 50% obstruction and 4 -70%
- Non invasive, cheap has largely replaced routine use of conventional

arteriography







Acute limb Ischaemia

- Surgery
 - Embolectomy with fogarty catheter
 - Can be done under LA











Exhibit 202194_05X



















Upper limb ischemia

















Aorta-Iliac occlusion













Infra-inguinal



leg exposures



Knee dislocation





Whey revascularize for a non-viable limb?



Complications of Acute limb Ischaemia

- Limb loss
- Death

- Compartment syndrome
- Reperfusion effects
- Volkmann ischemic contracture

Ischemia-reperfusion injury

- Ischemia refers to cessation or reduction of blood flow to and from a tissue.
- Reperfusion injury refers to damage to tissue caused when blood supply returns to the tissue after a period of ischemia.
- Reperfusion Syndrome = local + systemic signs of reperfusion injury

Main Role players

Ischaemia

- ATP and mitochondrial function
- Gene Activity

AP-1

HIF-1

VEGF

GLUT-1

COX-2

reperfusion

- Reactive Oxygen species
- Eicosanoids (PG, Thromboxane, Leucotrines)
- Nitric oxide
- Endothelin
- Cytokines (TNFα, IL-1, 6,8)
- Neutrophils
- Complement activation
- No-flow phenomenon

Local consequences of I/R injury in skeletal muscle

Revascularization of ischemic skeletal muscle:

oRelease of K+

- o Hydrogen ions
- o Myoglobin
- o Acid phosphatase
- o Amino Acids Nucleotide Purine bases

Systemic consequences of I/R injury

- Myocardial injury:
 - o Release of myocardial depressant factors: C3a, TxA2, LTD4, PAF
- Remote lung injury:
 - o Non-cardiogenic pulmonary edema activation of PMNs, endothelial injury
 - o ARDS
- Renal injury:
 - o Myoglobin deposition in renal tubules
 - o Acute tubular necrosis

Reperfusion effects

Local

 Reperfusion injury – paradoxical death of already dying muscles after reperfusion

Systemic

- Reperfusion syndrome
 - Hypotension
 - ARDS
 - Lactic acidosis
 - Hyperkalemia
 - Renal failure

Compartment syndrome

Clinical features

- Excessive pain pain on passive movements
- Numbness -e.g. anterior compt. first toe web (deep peroneal N)
- Tense swollen leg
- Do not look for absent distal pulse late



Fasciotomy









