



ACUTE LOWER LIMB ISCHEMIA

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Introduction

- Definition/Incidence.
- Pathophysiology of ACUTE ISCHEMIA embolic/thrombotic
- Diagnosis
 - clinical hx/PE
 - Need for imaging's
- Classification of acute ischemia
- Management



Definition/Incidence

- Acute limb ischemia occurs when there is an abrupt interruption of blood flow to an extremity .
- Either embolic or thrombotic vascular occlusion.
- 1.7/10,000 per year
- Mortality 25%
- Amputation 20%



Acute Limb Ischemia

- The most common vascular emergency
- Acute thrombotic occlusion of a pre-existing stenotic arterial segment (60%).
- Thromboembolism (30%)
- And trauma, may be iatrogenic.
- It is often but not always possible to distinguish these two conditions on clinical grounds alone



Etiology Of Acute Limb Ischemia

Embolus	Thrombosis	Trauma
Cardiac source	Vascular grafts	Blunt
Atrial fibrillation	Atherosclerosis	Penetrating
Myocardial infarction	Thrombosis of aneurysm	Iatrogenic
Endocarditis	Entrapment syndrome	
Valvular disease	Hypercoagulable state	
Atrial myxoma	Low flow state	
Prosthetic valves		
Arterial source		
Aneurysm		
Atherosclerotic plaque		
Paradoxical embolus		



Clinical features	Embolus	Thrombosis
Severity	Complete ischaemia (no collaterals)	Incomplete ischaemia (collaterals)
Onset	Seconds or minutes	Hours or days
Limb	Leg 3:1 arm	Leg 10:1 arm
Multiple sites	Up to 15%	Rare
Embolic source	Present (usually AF)	Absent
Previous claudication	Absent	Present
Palpation of artery	Soft; tender	Hard/calcified
Bruits	Absent	Present
Contralateral leg pulses	Present	Absent
Diagnosis	Clinical	Angiography
Management	Embolectomy, warfarin	Medical, bypass, thrombolysis
Prognosis	Loss of life > loss of limb	Loss of limb > loss of life



Frequencies of emboli sites lodgement

- Femoral — 28 percent
 - Arm — 20 percent
 - Aortoiliac — 18 percent
 - Popliteal — 17 percent
 - Visceral and other — 9 percent each
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- Emboli typically lodge where there is an acute narrowing of the artery, or a point where the vessel branches;

Pertinent Elements in Vascular History



- History of stroke or transient ischemic attack
- History of coronary artery disease.
- History of peripheral arterial disease
- History of diabetes
- History of hypertension
- History of tobacco use
- History of hyperlipidemia



CLINICAL EVALUATION

The six "P's" of acute ischemia are:

- Pain
- Pulselessness
- Pallor
- Paresthesias
- Paralysis
- Poikilothermia

Symptoms/signs



- Pain May be absent in complete acute ischemia; severe pain is also a feature of chronic ischemia
- Pallor Also a feature of chronic ischemia
- Pulseless Also a feature of chronic ischemia
- Perishing cold Unreliable, as the ischemic limb takes on the ambient temperature



- Paralysis, paraesthesia and muscle tenderness are the cardinal signs of **complete acute ischemia**.
- The limb must be revascularized within 4-6 hours if it is to be saved and full function restored.

Classification of acute extremity ischemia SVS/ISCVS



	Category		
	Viable	Threatened	Nonviable
Pain	Mild	Severe	Variable
Capillary refill	Intact	Delayed	Absent
Motor deficit	None	Partial	Complete
Sensory deficit	None	Partial	Complete
Arterial Doppler	Audible	Inaudible	Inaudible
Venous Doppler	Audible	Audible	Inaudible
Treatment	Urgent work-up	Emergency surgery	Amputation

Classification of acute limb ischemia

According to Rutherford

	Viable (I)*	Marginally threatened (IIa)*	Immediately threatened (IIb)*	Nonviable (III)*
Pain	Mild	Moderate	Severe	Variable
Capillary refill	Intact	Delayed	Delayed	Absent
Motor deficit	None	None	Partial	Complete, paralysis (rigor)
Sensory deficit	None	None or minimal (toes)	More than toes	Complete, anesthetic
Arterial Doppler	Audible	Inaudible	Inaudible	Inaudible
Venous Doppler	Audible	Audible	Audible	Inaudible
Treatment	Urgent evaluation	Urgent revascularization	Emergency revascularization	Amputation

Limb ischaemia is classified on the basis of onset and severity



Incomplete acute ischaemia (usually due to thrombosis in situ) can often be treated medically, at least in the first instance.

Complete ischaemia (usually due to embolus) will normally result in extensive irreversible tissue injury within 6 hours unless the limb is revascularized.

Irreversible ischemia mandates early amputation.



Natural History

- At first, acute complete ischaemia is associated with intense distal arterial spasm and the limb is 'marble' white.
- As the spasm relaxes over the next few hours and the skin fills with deoxygenated blood, mottling appears. This is light blue or purple, has a fine reticular pattern and blanches





As ischemia progresses, blood coagulates in the skin, leading to mottling that is darker in colour, coarser in pattern and does not blanch.

Finally, large patches of fixed staining progress to blistering and liquefaction



- **Pain on squeezing the calf** indicates muscle infarction and impending irreversible ischaemia.
- Attempts at revascularization at this late stage are futile and will lead to life-threatening reperfusion injury











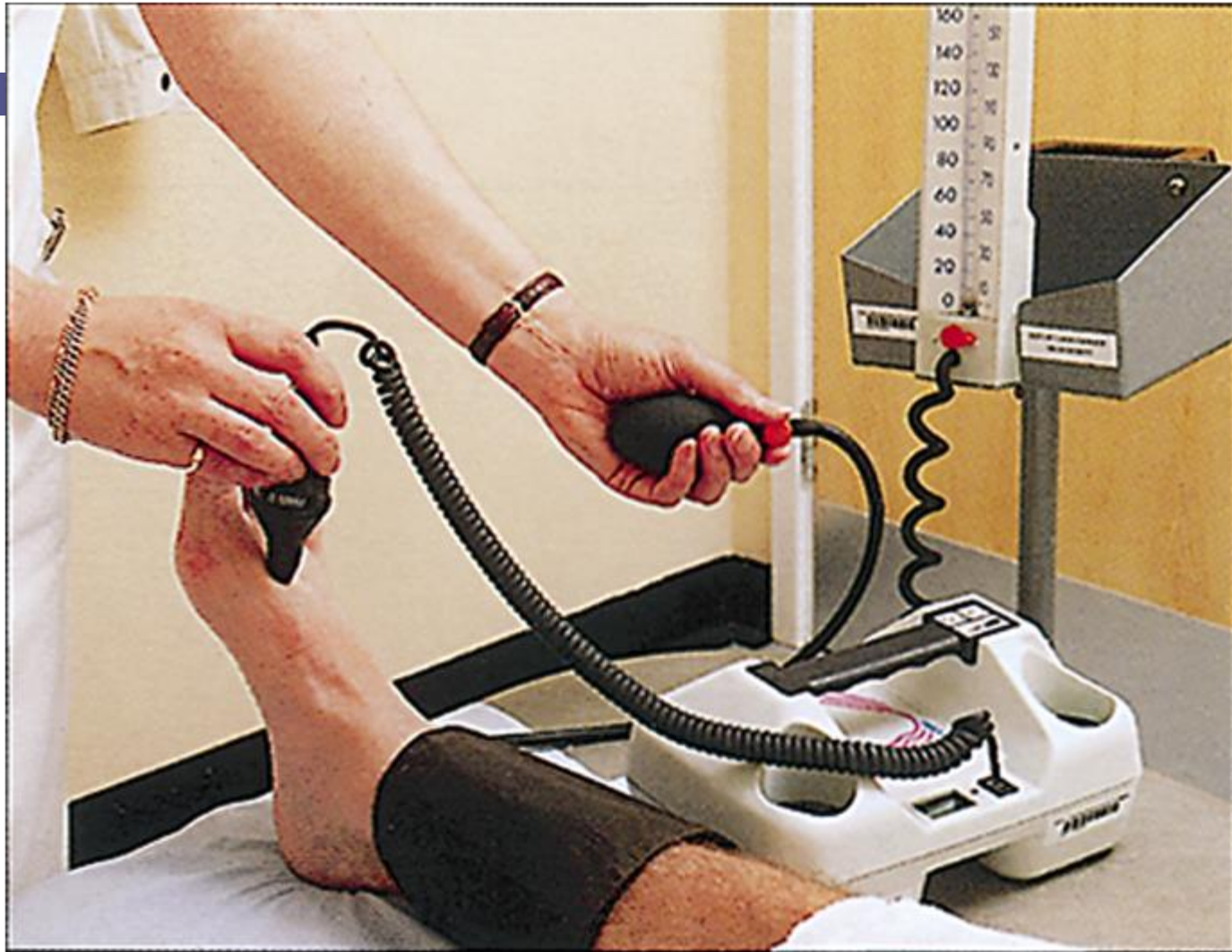
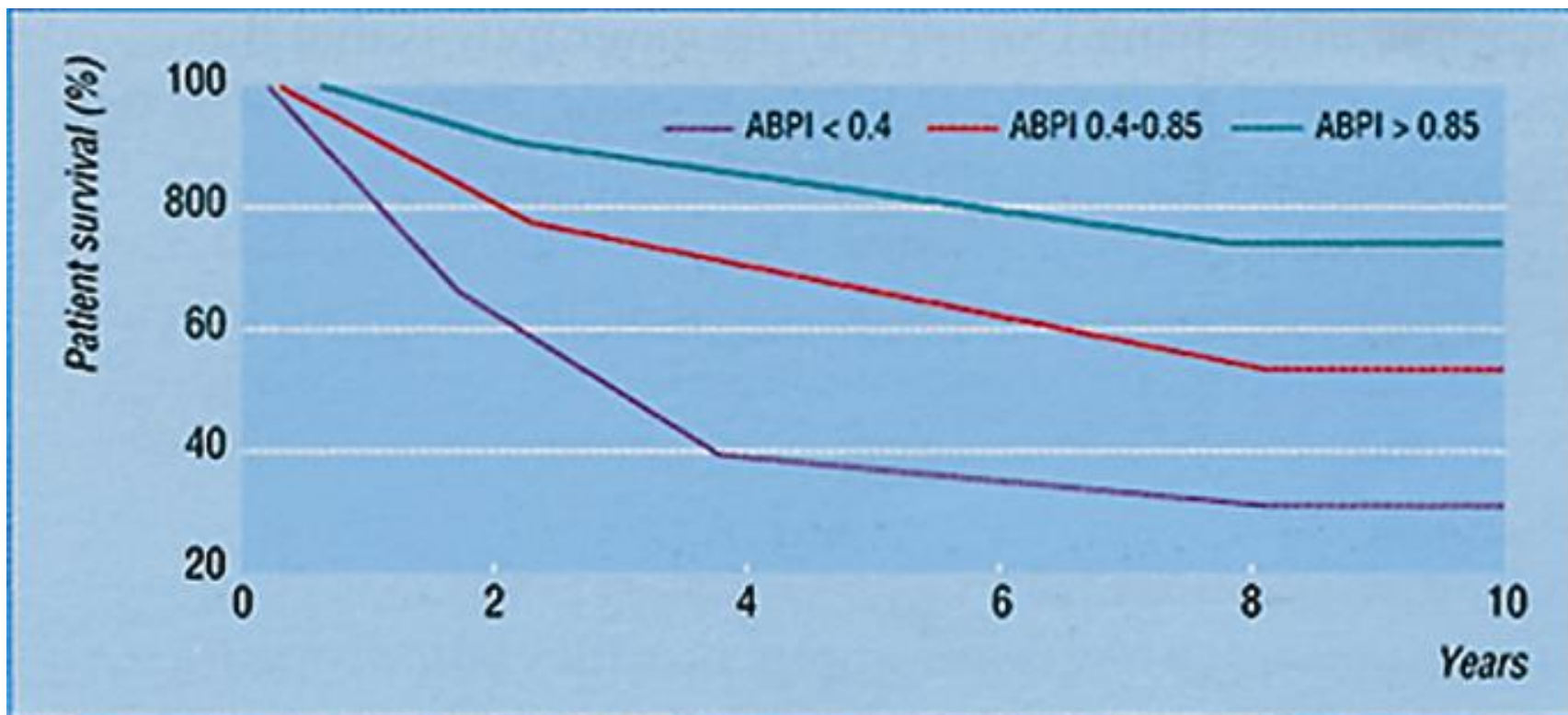
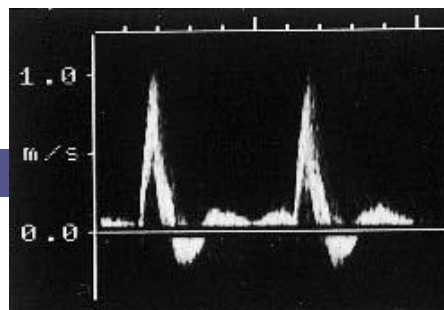


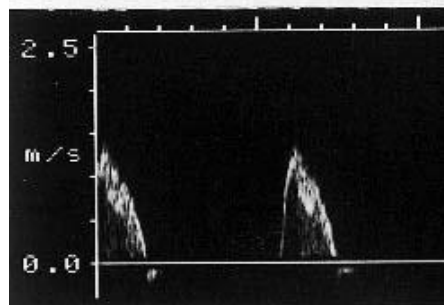
Figure 1.5



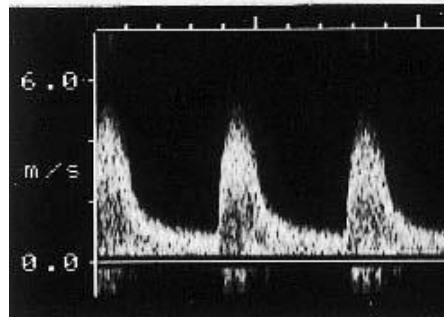
A



B



C



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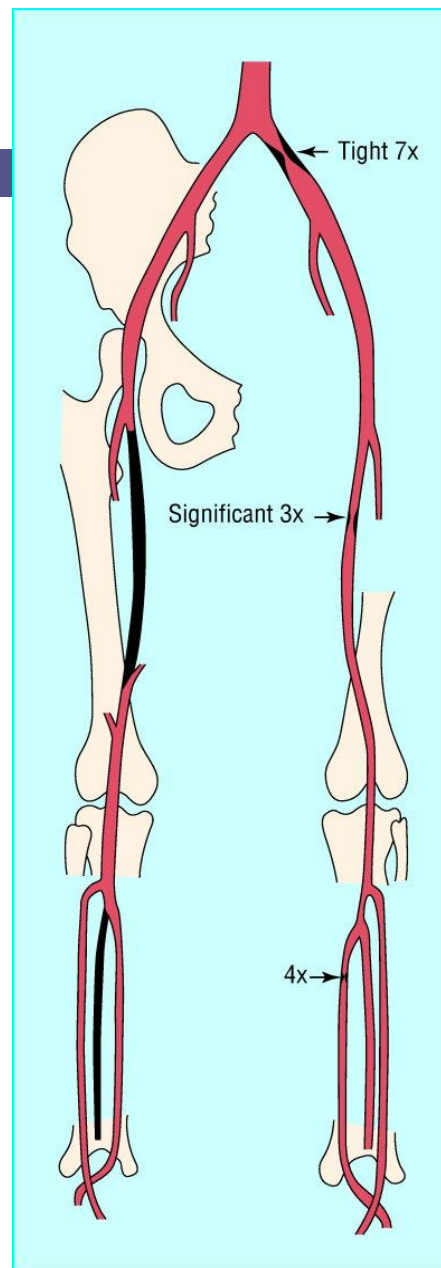
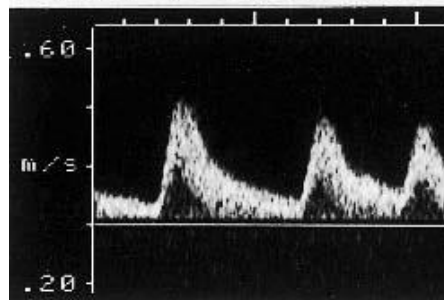
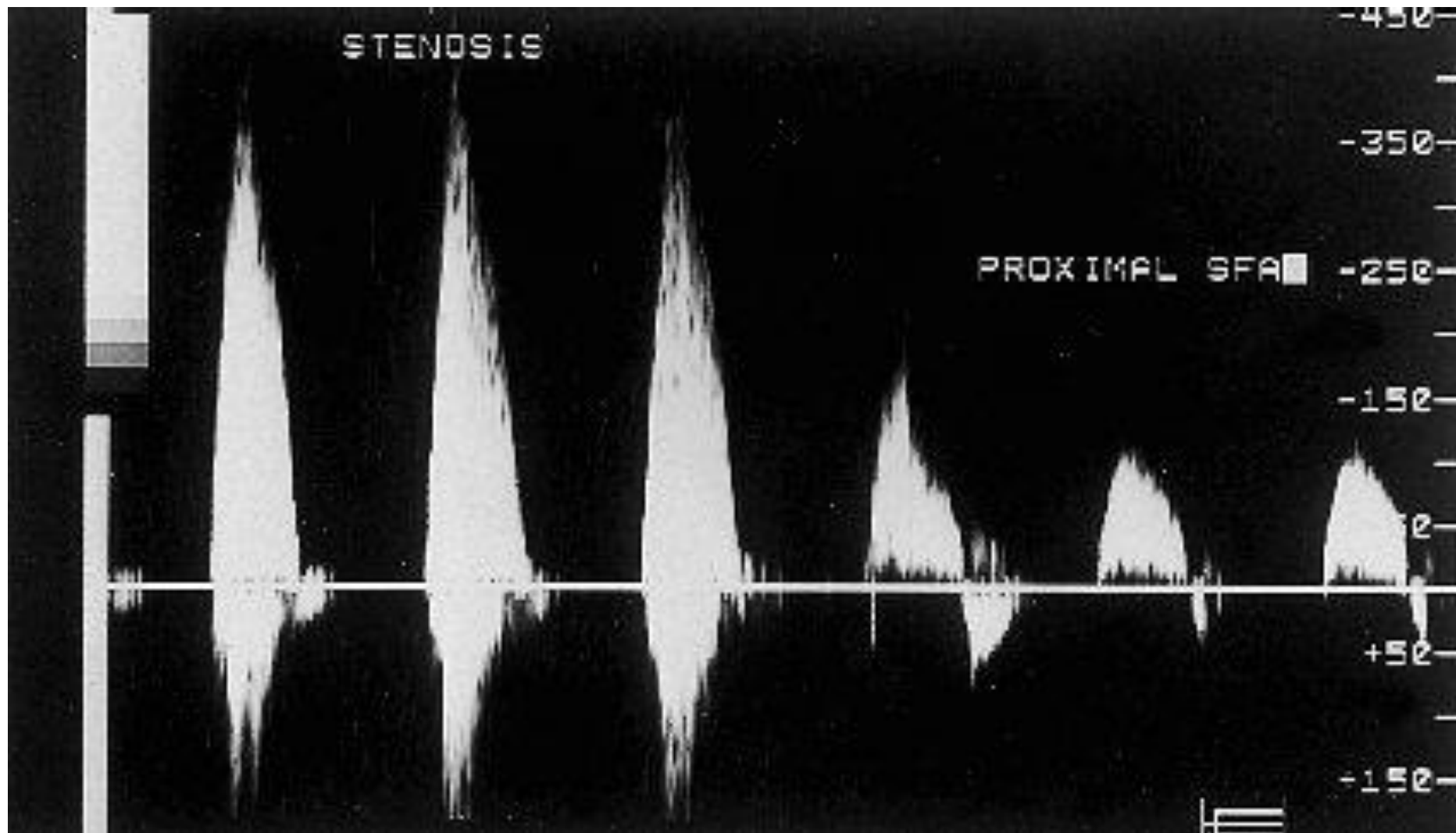


Figure 1.3



European Society for Vascular Surgery (ESVS) 2020 Clinical Practice Guidelines on the Management of Acute Limb Ischaemia

Table 3. Summary of imaging modalities in acute limb ischaemia

Modality	Availability*	Accuracy	Invasiveness	Therapeutic potential	Evaluation of entire vascular tree and adjacent structures
Duplex ultrasound	±	++	-	-	+
Computed tomography angiography	++	+++	-	-	+++
Contrast enhanced magnetic resonance angiography	+	++	-	-	++
Digital subtraction angiography	++	+++	+	+	+

* Availability is very much dependent on local conditions.



Arteriography

- Arteriography can usually distinguish between thrombosis and embolism
- An embolus
 - Sharp cutoff with a rounded reverse meniscus sign.
 - Intraluminal filling defect
 - Otherwise normal vessels,
 - Absence of collateral circulation,
 - Multiple filling defects.
- Arterial thrombosis
 - Sharp or tapered, but not rounded cutoff .
 - Diffuse atherosclerosis with
 - Well developed collateral circulation







Management

- Cardiac evaluation
- IV fluids
- IV Heparin

- Treatment

Viability of the limb.

Options include surgery and thrombolytics



- If embolism is obvious, embolectomy is performed,
- but if the diagnosis lacks certainty, an angiogram avoids a blind procedure.

- Operative angiography

- The surgical revascularisation required

The non-threatened limb



- If sensation and movement are present and calf tenderness is absent, A period of medical optimization and heparin therapy
- Angiography and reconstruction can then be done



Thrombolytic Agents

- Streptokinase/Urokinase
- Rt –PA
- Rt– PA is an alternative treatment to embolectomy

Indications of Intra-Arterial Thrombolysis

- Acute thrombotic arterial occlusion are considered the ideal candidates for lytic therapy
- Thrombolysis of arterial emboli has had mixed success.
- Clot in thrombosed bypass grafts



The threatened limb

- Loss of sensation/ loss of active movement
- Pain on passive movement and when the calf muscles are squeezed.
- A maximum of 6 hours to re-establish normal flow to avoid irreversible nerve and muscle injury
- Fasciotomy should always be considered upon successful reperfusion to avoid compartment syndrome.



The non-viable limb



- Features that indicate the limb is no longer salvageable include:
 - fixed staining of tissues
 - lack of blanching on pressure
 - anaesthesia with rigid muscles – rigor mortis.

These patients should not undergo an evaluation to define vascular anatomy or efforts to attempt revascularization.

SUMMARY

Management of a limb threatened by acute ischemia



- ❑ Make cardiorespiratory assessment of the patient
- ❑ Provide O₂ therapy and BP optimisation as necessary
- ❑ Provide analgesia
- ❑ Arrange blood tests (including clotting and cross match),
- ❑ ECG and chest X-ray
- ❑ Keep nil by mouth and give i.v. fluids

SUMMARY

Management of a limb threatened by acute ischemia



- Start i.v. heparin – 5000 IU stat and 1000 IU/hour
- Arrange imaging – duplex ultrasound, arteriogram or on-table arteriogram
- Obtain consent
- Consider Intra-Arterial Thrombolysis
- Perform Embolectomy/arterial reconstruction and consider fasciotomies



□ SUMMARY

□ QUESTIONS