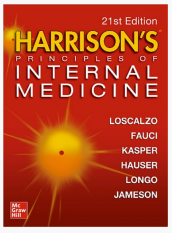
Disclosure

Roberto Ferraresi, MD

No conflict of interest with this presentation

2022



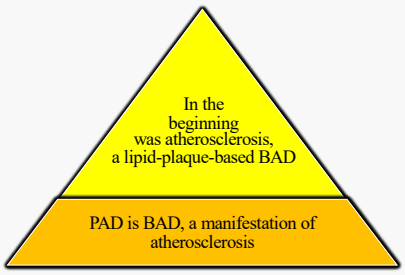
Chapter 281: Arterial Diseases of the Extremities - Peripheral Artery Disease

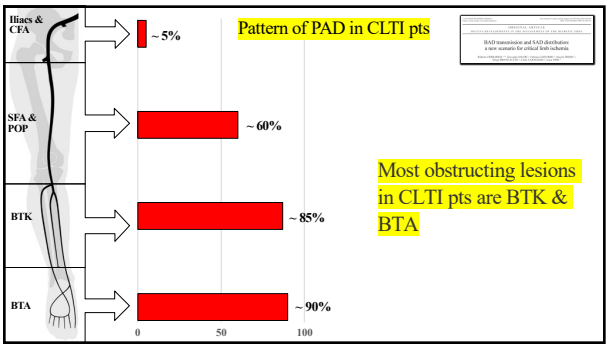
Mark A. Creager; Joseph Loscalzo

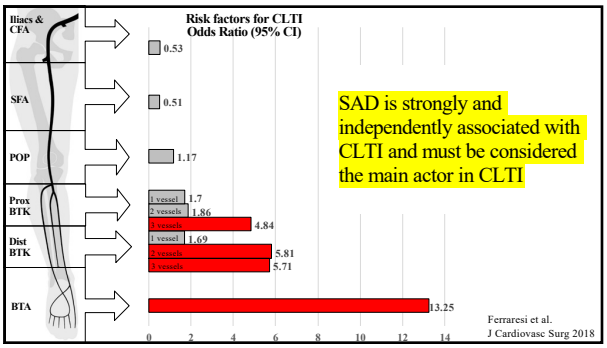
Atherosclerosis is the leading cause of PAD. Stenosis or occlusion are usually localized to large and medium-size vessels.

- abdominal aorta and iliac arteries (30% of pts)
- femoral and popliteal arteries (80–90% of pts)
- tibial and peroneal arteries (40–50% of pts)

The PAD dogma







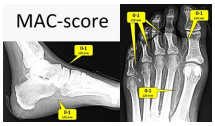
Meta-analysis on MAC

MAC is strongly associated with foot ulcer, occlusive PAD and amputation

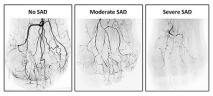
Losurdo F et al.
Vascular Medicine 2020

MAC & SAD scores in CLTI pts

MAC-score



SAD-score



SAD and MAC must be considered expressions of the same *nonatheromatous obstructing disease*, able to adversely impact the fate of CLTI patients

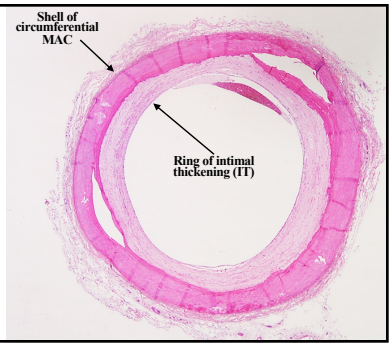
SAD and MAC scores are powerful prognostic indicators of MALE in CLTI patients, and this data was confirmed by many other Authors

Ferraresi et al, JEVT 2021

Open question

MAC develops within the medial layer of the arterial wall (outside the lumen) and is not inherently obstructive

How can be MAC correlated to SAD? What is the material obstructing the lumen?



Histopathological studies on amputated limbs due to CLTI

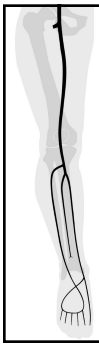
In the highest degrees of MAC, the artery is transformed into a rigid tube…, on such vessels there is usually a diffuse intimal overgrowth

Monckeberg, 1903

The most common findings were calcification of the media (72% of arteries) and intimal thickening without lipid (68% of arteries), with the presence of atheromas in only 23% of arteries.

Nonatheromatous intimal thickening was frequently severe, resulting in complete occlusion in some vessels.

O'Neill C et al.
Arterioscler Thromb Vasc Biol 2015



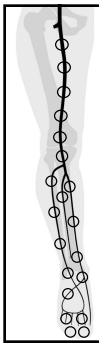
A new detailed histopathological study on amputated limbs evaluating prevalence, localization and obstructive role of:

- Atheromatous lesions
- Medial artery calcification (MAC)
- Intimal thickening (IT)

26 CLTI pts who underwent major amputation due to unreconstructable vascular disease and/or unsalvageable foot

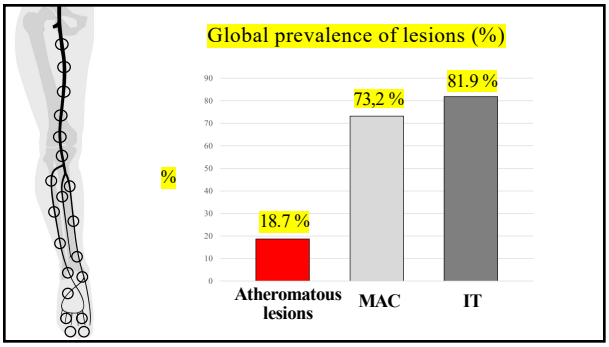
A. Ucci, C. Bianchini Massoni, P. Perini, E. Cabrini, A. Fornasari, A. Tafuni, A. Freyrie, D. Corradi, R. Ferraresi

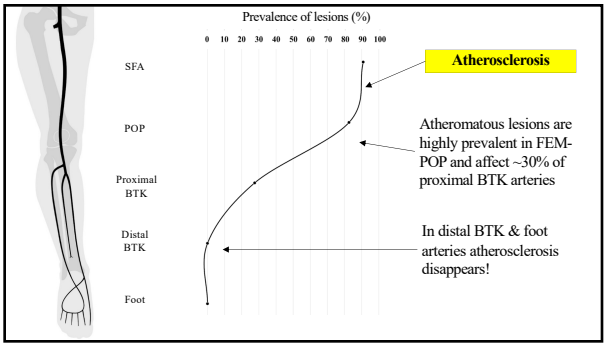
Parma's University Vascular Surgery
Submitted for publication

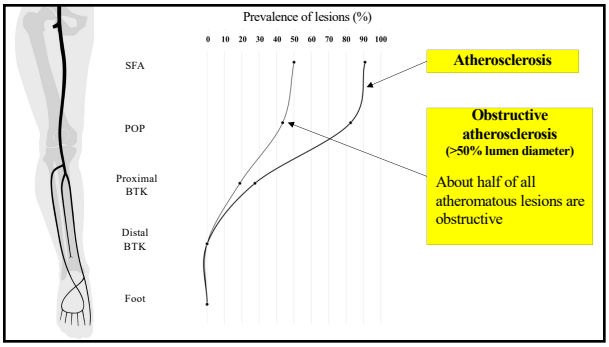


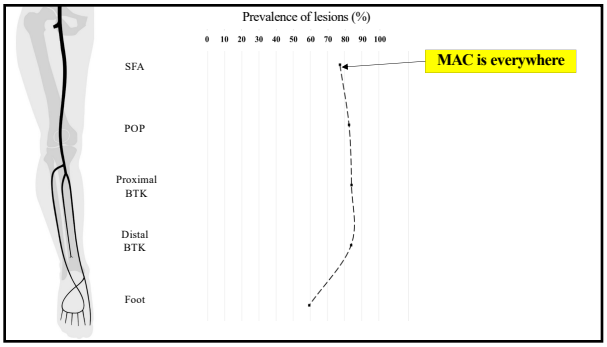
Extensive arterial sampling of the amputated limb

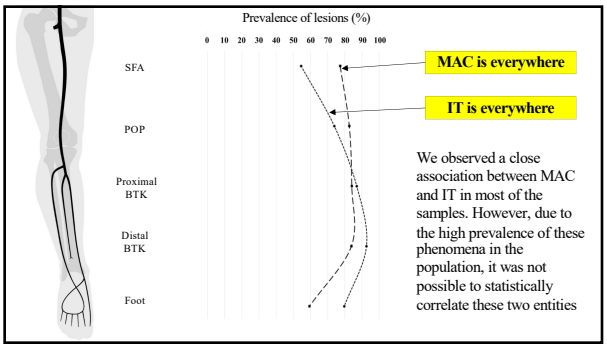
	Artery	Arterial samples N
Above-the-knee	SFA	22
	Popliteal artery	23
Prox BTK	ATA	23
	PTA	24
	PER	22
Distal BTK	ATA	24
	PTA	25
	PER	19
Foot	Retromalleolar PTA	23
	Dorsalis pedis artery	16
	Metatarsal arteries	18
	Digital arteries	20
	Lat. calcaneal branches	26
	Med. calcaneal branches	25
All samples		310

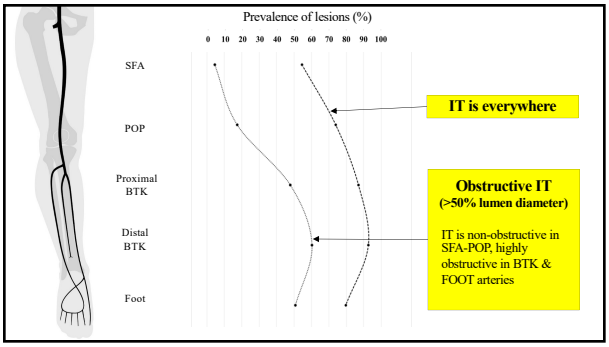

Global prevalence of lesions (%)
%
18.7 %
73,2 %
81.9 %
Atheromatous lesions
MAC
IT

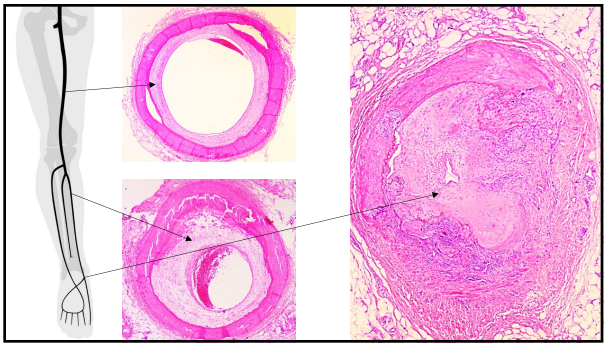

Prevalence of lesions (%)
SFA
POP
Proximal BTK
Distal BTK
Foot
Atherosclerosis
Atheromatous lesions are highly prevalent in FEM-POP and affect ~30% of proximal BTK arteries
In distal BTK & foot arteries atherosclerosis disappears!

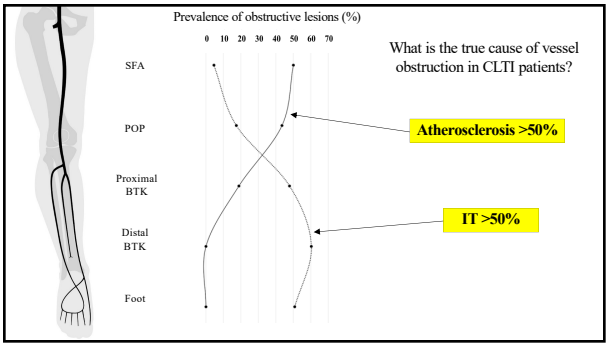

Prevalence of lesions (%)
SFA
POP
Proximal BTK
Distal BTK
Foot
Atherosclerosis
Obstructive atherosclerosis
(>50% lumen diameter)
About half of all atheromatous lesions are obstructive

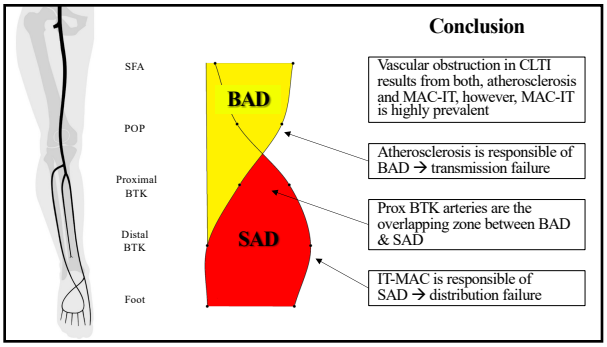

Prevalence of lesions (%)
SFA
POP
Proximal BTK
Distal BTK
Foot
MAC is everywhere

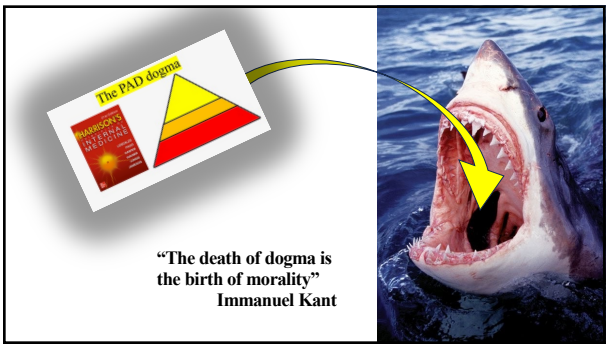

Prevalence of lesions (%)
SFA
POP
Proximal BTK
Distal BTK
Foot
MAC is everywhere
IT is everywhere
We observed a close association between MAC and IT in most of the samples. However, due to the high prevalence of these phenomena in the population, it was not possible to statistically correlate these two entities


Prevalence of lesions (%)
0 10 20 30 40 50 60 70 80 90 100
SFA
POP
Proximal BTK
Distal BTK
Foot
IT is everywhere
Obstructive IT
(>50% lumen diameter)
IT is non-obstructive in SFA-POP, highly obstructive in BTK & FOOT arteries




Prevalence of obstructive lesions (%)
0 10 20 30 40 50 60 70
SFA
POP
Proximal BTK
Distal BTK
Foot
What is the true cause of vessel obstruction in CLTI patients?
Atherosclerosis >50%
IT >50%


Conclusion
SFA
POP
Proximal BTK
Distal BTK
Foot
BAD
SAD
Vascular obstruction in CLTI results from both, atherosclerosis and MAC-IT, however, MAC-IT is highly prevalent
Atherosclerosis is responsible of BAD → transmission failure
Prox BTK arteries are the overlapping zone between BAD & SAD
IT-MAC is responsible of SAD → distribution failure


The PAD dogma
HARRISON'S INTERNAL MEDICINE
"The death of dogma is the birth of morality"
Immanuel Kant