Pattern of calcification: intimal vs. medial, and difference below and above the knee

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Conflict of Interest Declaration

- **Institution grant/research support**

- **Speaking Honoraria**
  - Abbott, Cook Medical
Talk Outline

• Intimal and Medial calcification in peripheral arteries
• Are patterns of calcification above and below the knee different and if so how?
• In diabetics is there excessive calcification and what type?
Intimal Calcification in commonly observed in SFA-POPLITIAL ARTERIES

Angiography

CT

Histology

X-ray

Branch Severe narrowing

Branch

Severe narrowing

Ca$^{2+}$

intima

media

Ca$^{2+}$

intima

media

Ca$^{2+}$

Branch

Ca$^{2+}$

Branch
Mönckeberg’s Medial Calcification in Asymptomatic Individuals

Kolodgie F, et al. ESVB 2007:49-70
Histologic Sections from Patients with CLI Undergoing a Lower Limb Amputation

Dorsalis pedis segment with CTO

Posterior tibial artery with atheromatous thromboemboli

Posterior tibial artery with circumferential medial calcification

Medial and Intimal calcification of the SFA
Plaque rupture with sheet calcification and propagated thrombus
Medial Calcification (Mönckeberg’s) in dorsalis pedis artery
Study of Vascular calcification in human peripheral arteries

Vascular calcification was assessed with five severely calcified peripheral arteries.

- Type of calcification: None, Microcalcification, Fragmented calcification, Sheet calcification, Nodular calcification
- Intimal vs. Medial calcification
- Bone formation

170 histologic sections (86 sections from superficial femoral artery [SFA] and 84 sections from popliteal artery) were evaluated.
Vascular calcification in human peripheral arteries, from 5 asymptomatic individuals

- Microcalcification
- Fragmented calcification
- Sheet calcification
- Nodular calcification
The relationship between % stenosis and plaque type

Fibrocalcific and nodular predominate

Fibrocalcific and fibroatheroma predominate
The relationship between % stenosis and intimal calcification pattern by histology

SFA+POP lesion (369 sections from 6 legs)

Below the knee lesion (1270 sections from 6 legs)

Nodular and sheet calcification predominate

Microcalcification and fragmented predominate
### Quadrant Calcification Grade

<table>
<thead>
<tr>
<th></th>
<th>Intimal</th>
<th>Medial</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>AK</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>444 lesions</td>
<td>65.9%</td>
<td>90.6%</td>
</tr>
<tr>
<td><strong>BK</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1126 lesions</td>
<td>81.1%</td>
<td>98.2%</td>
</tr>
</tbody>
</table>

Calcification in 10 asymptomatic legs.

(Notes: preliminary data)

The table and images illustrate the distribution of calcification in different quadrants of blood vessels, with calcium ions (Ca²⁺) marking the calcification sites. The data is from a study by Fanelli et al. (2014) published in Cardiovasc Intervent Radiol (2014) 37:898-907.
Peripheral vascular disease: who gets it and why?

58 patients (33 men [57%] and 25 females [43%]), age 43 to 95 years (mean 68.7 ± 12.5 years), who underwent a lower extremity amputation (33 [57%] below knee and the rest 25 [43%] above knee) over a 2 year period (Jan 2002 to Dec 2003). 50% had extensive non-healing ulcers and 71% had gangrene, which was more frequent in diabetics (n=34) versus non-diabetics (n=8, p=0.0032).

The presence of medial calcification and concomitant atherosclerosis was observed in 168 (77%) of the 218 arterial segments with atherosclerotic plaques. However, the extent of atherosclerosis did not correlate with the extent of medial calcification.

Diabetics have greater atherosclerosis, calcification and neovascularization than non-diabetics

<table>
<thead>
<tr>
<th>Characteristics</th>
<th>Diabetic</th>
<th>Non-diabetic</th>
<th>P value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number of Patients</td>
<td>40 (type II 80%)</td>
<td>18</td>
<td></td>
</tr>
<tr>
<td>Medial calcification</td>
<td>47.9% (majority having &gt;50% medial calcification)</td>
<td>28.6%</td>
<td>P&lt;0.001</td>
</tr>
</tbody>
</table>

Conclusion

- Intimal Atherosclerosis Calcification is frequently observed in both coronary and peripheral artery disease.
- Coronary arteries do not show medial calcification but it is commonly observed in patients with peripheral vascular disease.
- Our data suggest atherosclerotic and medical calcification is more common above the knee.
- The most frequent type of calcification is fragmented but sheets of calcification is most frequent in the femoral than popliteal arteries.
- Bone formation AK is seen in 10 to 15% of patients with peripheral vascular disease. Its significance is unknown.
- Medial calcification is common in peripheral arteries, especially in diabetes and CKD.
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