“Angioplasty First” Approach for Critical Limb Ischemia – 10 Year Experience at Singapore General Hospital

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Disclosure

I do not have any potential conflict of interest for this presentation
Our Approach For CLI

• “Angioplasty First” strategy for CLI since 2005
• Aggressive angioplasty regardless of lesion length or severity of stenosis / occlusion
  – TASC C and D lesions not excluded
  – Below the knee disease aggressively treated
  – Low threshold for Subintimal angioplasty and retrograde puncture (SAFARI technique)
• Aim to achieve at least one straight line flow into the pedal vessels
  – Direct angiosomal angioplasty if possible
Angioplasty in CLI

• Goal is to prevent major limb amputation and promote wound healing
  – Long term patency not crucial
• Cost is a big limiting factor
  – Limited subsidy for consumables
• Tend to accept imperfect angiographic result
  – No stents unless for bail out
How We Do It

• Non invasive imaging
  – Duplex
  – CTA/MRA

• ABI, TBI, Toe pressures

• Blood investigations
  – Full blood count
  – PT/PTT
  – U/E/Cr
Technique

- Treat inflow lesion first
- Downhill puncture preferred
  - Stage procedure if necessary
Downhill CFA puncture for flush SFA CTO
Key Points in Lower Limb PTA

• Long segment stenosis / occlusion are not contraindications as long as there is a vessel to link up to in the foot
  – Lateral projection of foot is mandatory

• IA GTN/papaverine
  – relieve / minimise vasospasm

• IA heparin 2500-5000U
Lower Limb Angioplasty at SGH

• Jan 2005 to Dec 2014
• 3525 procedures of 2563 legs in 2067 pats
  – Mean age 67.3 +/- 11.2 yrs, 54.6% Males
• 85.7% Rutherford Class 4/5/6 (CLI)
  – Claudicants 14.3%
• 85.9% has Diabetes
• 46.9% has Renal impairment (27.9% ESRF)
• 69.4% have infrapop PTA
• 29.6% Chronic Total Occlusions (CTO)
• Bail out stent rate 14%
Limb Salvage Rates

- Limb salvage
  - Freedom from major amputation (AKA, BKA, TKA)

- 75% 1 yr
- 65% 3 yr
- 61% 5 yr
Survival Rates

With major amputation but no ESRF

No major Amputation no ESRF

With major amputation and ESRF

P<0.001

No major amputation

With major amputation

P=0.018
SAFARI : SGH Experience

- January 2009 to Aug 2014
- 166 / 1277 patients (12.9%) had SAFARI
  - mean age: 70 yrs (36 to 112 yrs), 93 M : 73 F
- 89% diabetics, 42% ESRF
- 192 SAFARI procedures in 175 limbs (17 repeats)
- Treated segments
  - Fem-pop (39.6%), BTK (54.7%), both (5.7%)
  - CTO was 10cm or longer in 83.8% of treated segments
  - Bail out stenting in 21.4% (41/192)
SGH Experience

- 79.7% (153/192) technical success

Failures due to
- inability to cross lesion (23)
- unable to obtain distal access (4)
- poor flow post procedure due to recoil/dissection (12)

- 12 cases of distal embolisation
  - treated with catheter aspiration (11)
  - urokinase & anticoagulation (1)

- Limb salvage
  - 80.8% at 6 mths, 78.5% at 12 mths
Distal Puncture Site Patency

- No routine follow up angiography.
- 49 of 192 cases had repeat angioplasties
  - 41 showed distal puncture sites patent
  - 8 showed severe stenosis / occlusion.

![Graph showing frequency of patent and stenosed distal puncture sites](image-url)
What should be the angiographic end point for BTK intervention?

- Retrospective review of patients who presented with CLI for angioplasty
  - January 2009 to December 2011
  - 693 limbs in 511 patients
- Correlate completion angio with limb salvage

<table>
<thead>
<tr>
<th>Condition</th>
<th>Prevalence</th>
<th>Other Details</th>
<th>Percentage</th>
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</thead>
<tbody>
<tr>
<td>Age</td>
<td>67 ± 11 yrs</td>
<td></td>
<td>32%</td>
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<tr>
<td>ESRF</td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>Diabetes Mellitus</td>
<td>92%</td>
<td>Hx of CAD</td>
<td>44%</td>
</tr>
<tr>
<td>Hyperlipidemia</td>
<td>64%</td>
<td>Hx of CVA</td>
<td>20%</td>
</tr>
<tr>
<td>Hypertension</td>
<td>83%</td>
<td>Rutherford 5, 6</td>
<td>100%</td>
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</table>
Angiographic Predictors of Limb Salvage

- Number of crural vessel runoff (0, 1, 2, 3 vessels)
- Angiosome directed angioplasty (Direct versus Indirect)
- Plantar arch integrity (Complete, partial, absent)

(a) Complete  (b) Partial  (c) Partial  (d) Absent
Limb Salvage vs Crural Vessel Runoff

0 vs 1 vessel, p=0.005
1 vs 2 vessel, p=0.444
2 vs 3 vessel, p=0.548
Limb Salvage vs Angiosome Directed Angioplasty

Direct group

Indirect group

P=0.001
Limb Salvage vs Plantar Arch Integrity

CPA vs. PPA, p=<0.001
PPA vs. APA, p=<0.001
Limb Salvage, Angiosome Concept and Plantar Arch Integrity

- Complete plantar arch
  - Direct (DR), n=60
  - Indirect (IR), n=33
  - $p=0.285$

- Partial/Absent plantar arch
  - Direct (DR), n=137
  - Indirect (IR), n=152
  - $p=0.021$
Revascularisation / Angiographic End point

- At least 1 vessel run off is required for limb salvage
- Recanalizing 2 or 3 crural vessels does not significantly improve limb salvage compared to 1 vessel run off
- Plantar arch integrity is a strong predictor of successful limb salvage
- Study limitations
  - Many other factors that could affect limb salvage (eg, wound care/infection, diabetic control) were not investigated
Complications

- **Minor complications**: 15.6%
  - Groin hematomas
  - Self limiting GW perforations

- **Major Complications**: 5.5%
  - Puncture site pseudoaneurysm
  - Retroperitoneal hematoma
  - Distal embolism
  - Acute thrombosis

- **30 day Mortality**: 5.8%
  - 6 mth (17.6%), 12 Mth (21.4%)
In Our Practice.....

• “Angioplasty First” approach to CLI yielded good limb salvage rates except for ESRF patients.
• ESRF patients with major amputation have poor survival
• Revascularisation end point
  – 1 crural vessel runoff is sufficient if plantar arch is complete
  – If plantar arch is not complete, direct angiosomal angioplasty if possible or reconstruct the plantar arch rather than opening more crural vessels
• Using more drug eluting balloons and stents for fem-pop segment in recent years
• Still mainly POBA for BTK angioplasty (Currently conducting RCT on DEB vs POBA for BTK angioplasty)
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Thank you for your attention!