OCT GUIDED TREATMENT OF CALCIFIED LESIONS

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Disclosure Statement of Financial Interest

Within the past 12 months, I or my spouse/partner have had a financial interest/arrangement or affiliation with the organization(s) listed below.

Affiliation/Financial Relationship    Company
• Consulting Fees/Honoraria        • Cardiovascular Systems, Inc.
WHY IS IMAGING SO IMPORTANT? **CALCIUM**

CAC present in 90% by age 70

Ca underdiagnosed by angio

CA detected by angio in 38% pts, 73% by IVUS in same pts

IVI sensitivity increased up to 90-100%

Ca increases underexpansion and MACE


Madhavan et al. Coronary Artery Calcification. *JACC* 2014

CONSEQUENCE OF NO PRETREATMENT OF CA$^{2+}$

AREA 7.77 mm$^2$

AREA 2.11 mm$^2$

AREA 8.01 mm$^2$
DIAGNOSE CALCIFIC PLAQUE

CALCIUM

DEEP

NODULAR

SUPERFICIAL

TRADITIONAL TECHNIQUES (NC BALLOON/SCORING/CUTTING)

ABLATIVE TECHNIQUES (ATHERECTOMY)
DESCRIPTION OF DEEP CALCIUM

PRESENCE OF THICK FIBROTIC CAP
- NON-LUMINAL

TRADITIONAL TECHNIQUES (NC BALLOON/SCORING/CUTTING)
DESCRIPTION OF CALCIFIED NODULE

SUPERFICIAL CALCIUM
- LUMINALLY PROTRUSIVE
- ATTENUATION PRESENT (PROB DUE TO THROMBUS) FROM THROMBOGENIC SURFACE

ABLATIVE TECHNIQUES
(ATHERECTOMY)
DESCRIPTION OF **SUPERFICIAL CALCIUM**

- MINIMAL TO NO FIBROTIC LAYER
- DEPTH OF CALCIUM LIKELY MEASURABLE

ABLATIVE TECHNIQUES (ATHERECTOMY)
### Hypothesis: There will be a step-wise decrease in stent expansion according to the CVI score

1. **Fujino et. al. TCT 2017**
A SCORING ALGORITHM HELPS US RECOGNIZE WHEN WE NEED HELP

✓ GREATER .5mm DEPTH
✓ GREATER 180° ARC
✓ GREATER THAN 5mm in LENGTH

1. Fujino et. al. TCT 2017
... AND WHAT DOES ABLATION LOOK LIKE

270° ARC OF CALCIUM

OAS ABLATION

POST DES

FRACTURE
ATHERECTOMY CASE EXAMPLE
OCT DIAGNOSIS: CALCIFIED NODULE
OAS

ABLATED CALCIFIED NODULE
FINAL ANGIOGRAM
CALCIFIED NODULE → ATHERECTIONOMY → MSA MAXIMIZED

PRE

POST OAS

POST DES
7 Steps to Success

1. **STEP 1 - MORPHOLOGY**
2. **STEP 2 - LENGTH**
3. **STEP 3 - SIZE**
4. **STEP 4 - COREGISTRATION**
5. **STEP 5 - EDGE DETECTION**
6. **STEP 6 - APPOSITION**
7. **STEP 7 - LUMINAL GAIN**
CASE EXAMPLE
DIAGNOSE CALCIFIC PLAQUE

CALCIUM

DEEP

NODULAR

TRADITIONAL TECHNIQUES (NC BALLOON/SCORING/CUTTING)

SUPERFICIAL

ABLATIVE TECHNIQUES (ATHERECTOMY)
STEP 1  MORPHOLOGY  ➔  CALCIUM

DIAGNOSIS OF CALCIUM
• Low reflectivity
• Heterogeneous
• Sharp margins
• Isolated, strong reflections

- SUPERFICIAL CALCIUM
- 323 ° Arc
- LOWEST DEGREE OF THICKNESS: 520 μm
- LENGTH OF CALCIFICATION: 15 mm

ORBITAL AHERECTOMY
STEP 2 LENGTH → 30mm
STEP 3 SIZE → 2.75mm Diameter

LOCATE EEL

DISTAL

PROX

A Lumen Contour:
- Area: 3.54mm²
- Mean Diameter: 2.12mm
- Min: 2.07mm
- Max: 2.20mm

B Length: 2.71mm
C Length: 2.87mm

A Lumen Contour:
- Area: 7.64mm²
- Mean Diameter: 3.11mm
- Min: 2.90mm
- Max: 3.45mm

2.79mm 3.11mm
STEP 4  CO-REGISTRATION

- Eliminates angiographic ambiguity
- Minimizes geographic miss during stent placement

Length 30mm
2.25X18 mm DES to D1
OAS of LAD
2.75 X 30mm DES to LAD

3.0 X 20mm NC Balloon
STEP 5 EDGE DETECTION ➔ NO DISSECTION

DISTAL

PROX

SMALL INTIMAL DISSECTIONS
STEP 6: APPosition

✓ IMMEDIATE ASSESSMENT OF APPosition
STEP 7 STENT EXPANSION

✓ MLA 1.31mm² → MSA: 4.73mm²

✓ DES EXPANSION: 96.1%
EVIDENCE OF CALCIUM FRACTURE
CONCLUSION

✓ ANGIO UNDERESTIMATES CALCIUM

✓ SEVERE CALCIUM AFFECTS PROCEDURAL SUCCESS
  - ACUTE (NOT ACHIEVING LUMINAL GAIN, MULT STENTS, LONG PROCEDURES)
  - CHRONIC (RESTENOSIS DUE POOR EXPANSION)

✓ IMAGING IMPORTANT FOR PROPER DIAGNOSIS AND CLASSIFICATION OF SEVERITY.)

✓ CLASSIFICATION OF SEVERITY ALLOWS FOR STRATEGIC ASSESSMENT FOR TREATMENT STRATEGIES.