Question Time:
Calcium Score Selfie
CT Calcium Scoring in 2014 is….

1. …not proven in CVS risk assessment
2. …a proven part of the new ‘imaging’ methods of CVS risk assessment?
3. …the most accurate single test for CVS risk assessment?
4. …a valuable additional tool for CVS risk assessment, to be used in conjunction with traditional risk factors and FH of CVS Disease
5. …the best invention since sliced bread?
Who Assesses Patients for CVS Risk?

- GPs & Cardiologists (private)
  - Us!
- Practicing Clinicians with a knowledge of this large clinical problem:
  - “Doc. How do I avoid a heart attack which killed my Dad?”
  - Many Clinicians struggle with this problem
Do We Really Understand Atherosclerosis?
Atherosclerosis is a Highly Complex Ageing of the Arteries

Lifestyle

Genetic

Atherosclerosis is Poorly understood: but is driven by *lifestyle* and *genetic* factors
Moderate Coronary Stenosis: Approx 50%
Severe Coronary Stenosis
What is a CT Calcium Score Test?

- X-Ray ‘slices’ of the heart
- 3mm Intervals
- About 50 cardiac slices per scan
- Computer-assisted algorithm
- Score relates to volume and density of calcium in the coronary arteries
- “Agatston” Units
- Use on asymptomatic People
Images from a CT Calcium Score Test

No calcium

Heavy calcium
The Radiation Dose of a CT Calcium Score is Reasonable as a Screening Test

Calcium Score (Alone)

~ 1 mSv: ~ Same as a Mammogram

Background Radiation dose in NZ is 3 mSv/year
CTA Ca Score Case History

• 48 year old Indian Accountant
  – Non smoker
  – TC 6.0, LDL 4.0, HDL 1.0, TG 2.2, Ratio = 6
  – BP: 135/85

• Mother CABG at 63 years

• Reluctant to take pills

• CVS Risk Assessment
Framingham 5-year CVS Risk 2.5 to 5%

10% 5-Year CVS Risk: ‘Know your Numbers’
Can the USA Framingham Tables Really Predict CVS Risk: in Acute Coronary Syndrome Patients in NZ?
Auckland City Hosp CCU Pts 1 June 06 to 30 June 07
J Looi, CJ Ellis et al CSANZ 2008

Pts with NZ Framingham CVS Risk > 15% over 5 Years

229 pts: ‘Young’ (male<55, female<65 years), no prior CVS disease
CTA Ca Score Case History

• 48 year old Indian Accountant
  – Non smoker
  – TC 6.0, LDL 4.0, HDL 1.0, TG 2.2, Ratio = 6
  – BP: 135/85

• Mother CABG at 63 years

• Reluctant to take pills

• CVS Risk Assessment

• Exercise Treadmill Test
“You’ll probably find this considerably more strenuous than other treadmill tests you’ve taken.”
Angiography: Severe Circumflex Stenosis
CTA Ca Score Case History

• 48 year old Indian Accountant
  – Non smoker
  – TC 6.0, LDL 4.0, HDL 1.0, TG 2.2, Ratio = 6
  – BP: 135/85

• Mother CABG at 63 years

• Reluctant to take pills

• CVS Risk Assessment

• Exercise Treadmill Test

• Calcium Score
Normal Population of Ca scores: Men

Hoff et al, Am J Cardiol 2001

Top 10%
Top 25%

Coronary Calcium Score (Agatston)

Percentile
Normal Population of Ca scores: Men

Hoff et al, Am J Cardiol 2001
CTA Ca Score Case History: Comment

- 48 year old Indian Accountant
- Calcium score 1304 Agatston units: > 90th percentile for age/gender-matched ‘Normal’ population (154 = 90th percentile)
- Now highly motivated, can see calcium in arteries
  - Atorvastatin 80mg, ezetimibe 10mg
  - Aspirin 100mg, lifestyle ++
- VERY useful Calcium score test
What is the Science to show that Calcium Scores Predict CVS Risk?
A Coronary Calcium Score of $\geq 100$ Agatston units
Resulted in $x$ 10 times increase risk of a CVS events

The Coronary Calcium Score
- Was superior to the Framingham Risk Equation (Receiver-operator curve $0.79 \pm 0.03$ vs $0.69 \pm 0.03$, $p=0.0006$)
- Enhanced stratification of Framingham Risk categories, low, intermediate, high risk ($p<0.0001$)
St Francis Heart Study: Coronary Event Rates as a function of Calcium Score within Framingham Risk Groups

Arad JACC 2005;46:158-65
Calcium Score & Any Coronary Events: MESA Study  NEJM 2008;358:1336-45
Risk-Adjusted Cumulative Survival by Ca Score

25,253 Patients

Budoff 2007, JACC
Calcium Score Level Predicts CVS Events More Than Age

Results: Agatston Calcium Score by Band of 5-Year CVS Risk Estimated by the NZ Guidelines Group 2009 ‘Adjusted’ (Anderson) Framingham Equation


N=3477 pts

Framingham CVS 5 Year Risk Estimate %
(Incorporating 2009 NZGGG Adjustments)

22% (CI 20-24) of patients predicted to be at low 5 year CVS risk have Ca scores ≥ 100
Background: Are We Surprised that Epidemiological Studies Struggle to Accurately Detect CVS Risk for Individuals in New Zealand?
Illogical Process?

In Other Areas of Medicine, we ‘Look for Disease’

• Breast Cancer: Mammogram
• Colon Cancer: Colonoscopy

BUT

• Coronary Artery Disease: ‘Coloured Charts’ or Equations of Risk Factors?

What happens if we ‘Look for Disease’ in Coronary Artery Disease?

• Calcium Scoring
Calcified Coronary Arteries

- Intuitive for CVS Risk
  - Look for disease
  - Concept used elsewhere

- Calcified Atherosclerosis
  - The ‘End Product’ of all CVS risk factors [known or unknown]

- The extent of coronary atherosclerosis:
  - The strongest predictor of CVS events
Could Coronary Calcium Scoring be the Logical Way to Assess CVS Risk?

• Radical break from ‘epidemiological’ to ‘Imaging’ CVS Risk assessment
  – ‘Established’ opinion & programmes challenged
  – Focus may initially be away from lifestyle factors which need to be changed: smoking, obesity, exercise
  – Initially more expensive

• Better assessment of CVS risk
  – Possibly better compliance with lifestyle
  – Probably better targeting & compliance of medications
CVS Risk Assessment

NB: A Calcium Score is MORE Predictive of CVS Risk than the Framingham Equation

Framingham-Based: 5 or 10-Year Risk & “Lifetime-Risk”

Family History

“Modern Risk Factors”

Calcium Scoring (& CT Angiography)
Potential Identification of more High & Low-Risk Individuals using Calcium Scoring

High: > 20%
Intermediate: 10% - 20%
Low: < 10%

Estimated 10-Year AND Long-Term Risk
A Revolutionary Idea!

Doctor, I want to choose how I’m treated

Hmm. You’re not just ill – you’re deluded
How do Statins Work?

• Stabilise atheromatous plaque
• Strengthen ‘cap’
• Decrease plaque inflammation
• ‘Safer Ageing’
• ‘Fewer blockages’
CT Calcium Scoring in 2014 is:

1. not proven in CVS risk assessment
2. a proven part of the new ‘imaging’ methods of CVS risk assessment?
3. the most accurate single test for CVS risk assessment?
4. a valuable additional tool for CVS risk assessment, to be used in conjunction with traditional risk factors and FH of CVS Disease
5. the best invention since sliced bread?