Assessment of Chest Pain

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History

- **Location.** Where, Focal vs Diffuse.
- **Character.** Dull/Sharp/Stabbing/Burning/Squeezing/crushing/Tearing/Heavy
- **Radiation.**
- **Timeframe.** When did it start? Previous events
- **Onset/Offset.** Gradual/Sudden
- **Severity.** Scales e.g. 9/10.
- **Aggravating factors.** Exertion, Emotion, Respiration, Coughing, Eating, Posture
- **Relieving factors.** Rest, Sitting up, Antacids
- **Associated symptoms.** Nausea/Vomitting, Sweating, SOB, pre-syncope, Confusion, Neurological symptoms.

Chest Pain: Physical Examination

- General appearance – pyrexial, pale, jaundiced, cyanosed
- Pulse – bradycardia, tachycardia, difference in pulse volume in both arms, femoral artery, carotid bruits
- BP – low, high, difference between arms
- JVP - high
- Respiratory - rate, abnormalities on percussion, auscultation
- Cardiac examination – murmurs, pericardial rubs
- Thoracic cage – tenderness, lumps and bumps
- Abdominal examination
- Skin – rashes

Causes of chest discomfort

Skin – shingles, Zoster Sine Herpete

Muscular
- Postural/movement
- Cough

Skeletal
- Bone pain from secondaries/fractures
- Teitze's syndrome
- Bornholm's disease

Pleural
- Infection
- Malignancy

Oesophageal
- Spasm
- Reflux/ulcer/tear
- Malignancy
- Infection

Myocardial ischaemia/infarction

Pulmonary
- Tracheitis
- Embolism
- Pneumonia
- Asthma
- Malignancy
- Pneumothorax

Pericardium/Myocardium

Vascular
- Aortic dissection

Sub-diaphragmatic
- Cholecystitis/pancreatitis

Neural
- Thoracic disk
- Cervical disk
- Thoracic outlet syndrome

Anxiety

Life Threatening Causes of Chest Pain

Condition	Quality	Radiation	Associated Signs and Symptoms	Exacerbating Factors	Relieving Factors
Acute MI or acute coronary syndrome	Chest pressure, heaviness, tightness, poorly localized	Neck, jaw, shoulders, arms	Nausea, diaphoresis, dyspnea, Levine sign	Exertion, emotional distress	Rest, nitrates, β-blockers, calcium-channel blockers
Pulmonary embolus	Sudden onset, pleuritic chest pain	—	Dyspnea, cough, +/- hemoptysis, +/- effusion	Deep breaths	Oxygen
Acute aortic dissection	Sudden onset, "tearing" anterior chest pain or back pain	Interscapular area	Δ SBP greater than 20 mmHg between arms, new AI murmur, CXR with widened mediastinum	Hypertension, exertion	Rest, blood pressure control
Tension pneumothorax	Sudden onset, unilateral pleuritic chest pain	—	Dyspnea	Exertion, deep breaths	Oxygen, rest

Chest Pain

Diagnostic features of angina

Aggravating factors:	predictable level of exercise, emotional stress, exercise plus heavy meal, cold weather
Relieving factors:	GTN, cessation of activity
Duration:	less than 15 minutes
Location:	retrosternal, infrequently epigastric or infrascapular
Radiation:	bilaterally across the chest, one or both arms, shoulders, back epigastrium, neck and lower jaw
Description:	heaviness, tightness, pressure, constriction, dull and deep, indigestion Ethnic groups/language barrier: sharp, burning, discomfort, "just pain", "like fire"

Do not use people's response to glyceryl trinitrate (GTN) to make a diagnosis
NICE-2016

Other features which make a diagnosis of stable angina unlikely are when the chest pain is:
– continuous or very prolonged **and/or**
– unrelated to activity **and/or**
– brought on by breathing in **and/or**
– associated with symptoms such as dizziness, palpitations, tingling or difficulty swallowing.
Consider causes of chest pain other than angina (such as gastrointestinal or musculoskeletal pain).

NICE Clinical Guideline

NICE Guidelines Stable Angina 2016

Clinical diagnosis of angina.

Take a history
- Age and sex
- Characteristics of chest pain
  - Constricting discomfort in the front of the chest, neck, shoulders, jaw or arms
  - Precipitated by physical exertion
  - Relieved by rest or GTN within about 5 minutes
- Associated symptoms
- Cardiovascular history
- Cardiovascular risk factors

Physical examination
- Identify risk factors for CVD
- Identify signs of other CVD
- Identify non-coronary causes of angina (eg severe aortic stenosis)
- Exclude other causes of chest pain.

Routine investigation
- Blood tests to rule–out conditions exacerbating angina eg anaemia
- 12 lead ECG – changes consistent with coronary disease
  - Pathological Q waves
  - Left bundle branch block
  - Regional ST/T change

Clinical diagnosis driven mainly by the characteristics of chest pain

Non–anginal pain	Atypical angina	Typical angina
≤1 characteristic	*2 characteristics*	*All 3 characteristics*

Adam Timmis, and Carl A Roobottom Heart 2017;103:982-986

Chest Pain

ACS – atypical chest pain presentations

Females have atypical presentation

Mild dull pain
Isolated jaw pain
Isolated arm pain
Isolated interscapular pain
Bilateral wrist pain
Epigastric pain
Burning/sharp/tight chest pain associated with burping

NICE Guidelines 2016 - Recent-onset chest pain of suspected cardiac origin: assessment and diagnosis

ACS

Initially assess people for any of the following symptoms, which may indicate an ACS:

- pain in the chest and/or other areas (for example, the arms, back or jaw) lasting longer than 15 minutes
- chest pain associated with nausea and vomiting, marked sweating, breathlessness, or particularly a combination of these
- chest pain associated with haemodynamic instability
- new onset chest pain, or abrupt deterioration in previously stable angina, with recurrent chest pain occurring frequently and with little or no exertion, and with episodes often lasting longer than 15 minutes.

Refer to Hospital if ACS suspected

Chest Pain

Primary Care

- Blood tests – U&E's, eGFR, thyroid function tests, liver function tests, fasting lipids, fasting glucose, full blood count, ?troponin
- ECG
- CxR

Secondary Care

Cardiac CT/Calcium score
Exercise testing
Echo
Stress echo
Myocardial perf. scan
Coronary angio
CTPA
Cardiac MRI
Genetic testing

History/Examination → Provisional Diagnosis → Refer or not to refer

Refer or not to refer → Primary care / Elective referral / Direct to Hospital

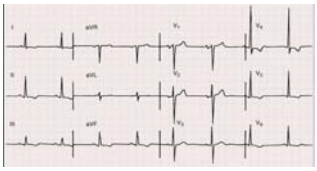
ECG

A number of changes on a resting 12-lead ECG are consistent with CAD and may indicate ischaemia or previous infarction.

These include:

- **pathological Q waves**
- **LBBB**
- **ST-segment and T wave abnormalities (for example, flattening or inversion).**

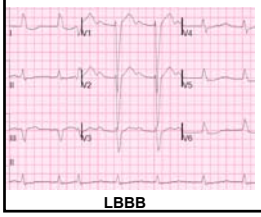
RBBB



T wave inversion

ECG

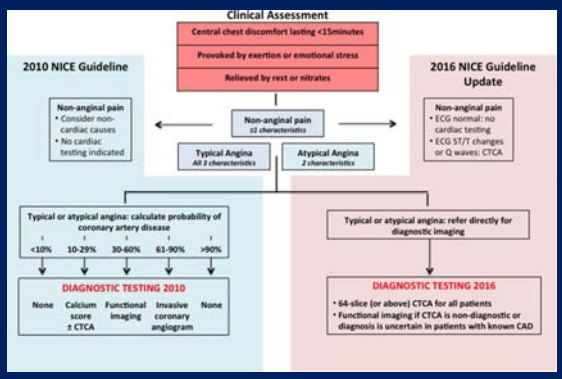
ST depression



LBBB

Q waves

Diagnostic testing for people in whom stable angina cannot be excluded by clinical assessment alone: changes in NICE guideline recommendations 2010–2016.



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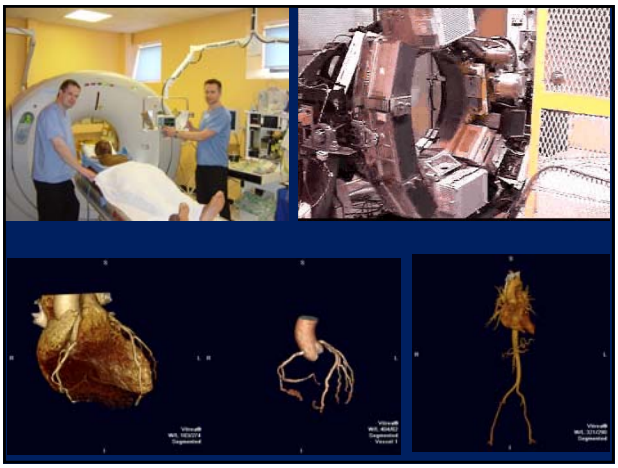
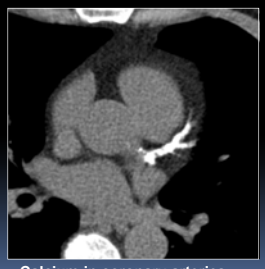


Cardiac CT – 2 Tests

CT Calcium Scoring



Calcium in coronary arteries represents atherosclerosis

CT Coronary Angiogram

Degree of Calcium correlates with atheroma burden

Cardiac CT – 2 Tests

CT Calcium Scoring

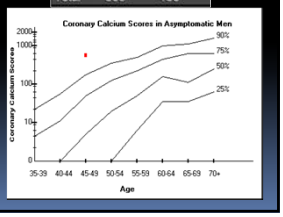
- Easy quick procedure (<15 min)
- No intravenous contrast
- No heart rate control
- Radiation dose < 1 mSv
- Rapid interpretation & reporting

CT Coronary Angiogram

- Short out-patient procedure (15-60 min)
- Non-invasive, only iv contrast
- HR < 65 bpm (Beta-blockers)
- Radiation dose 0.5-4 mSv

What is coronary calcification ?

Region	Agatston	Volume
LM	13	19
RCA	168	158
LAD	199	166
CX	130	112
PDA	0	0
Other1	0	0
Other2	0	0
Other3	0	0
Total	509	430



Coronary calcification in Asymptomatic

MESA (Multiethnic Study of Atherosclerosis)

NIH sponsored prospective study

6,814 Asymptomatic pts: 3.5 year follow-up

	Major Coronary Event		
CAC score	No. at risk	Hazard Ratio (95% CI)	P-value
0	8/3409	1.0	
1-100	25/1728	3.89 (2.72-8.79	<0.001
101-300	24/752	7.08 (3.05-16.47	<0.001
>300	32/833	6.84 (2.39-15.99)	<0.001

Detrano RC et al. N Engl J Med 2008;358:1336-5.

Limitations of CTCA

- Rapid (>80 bpm) and irregular HR
- High calcium scores (>800-1000)
- Stents
- Contrast requirements (careful in CKD)
- Small vessels (<1.5 mm) and collaterals
- Obese and uncooperative patients
- RADIATION EXPOSURE

Comparative Effective Dose of Radiological Investigations

PA/Lateral CXR	0.04-0.06 mSv
Head CT	1-2 mSv
Chest CT	5-7 mSv
Abd/Pelvis CT	8-11 mSv
Diagnostic Cor. Angiogram	2-5 mSv
CTCA/cardiac CT	0.5-4 mSv

Life time cancer risk
1mSv = 1:20,000 additional risk
10mSv = 1:2000 additional risk
20mSv = 1:1000 additional risk

RADIATION EXPOSURE

Table 3. Estimated Risks of Fatal Malignancy or Death Resulting From Radiation Exposure and the Lifetime Odds of Dying as a Result of Selected Activities of Everyday Life

Exposure	Estimated Risk of Fatal Malignancy or Lifetime Odds of Dying (per 1000 Individuals)
Effective radiation dose	
1 mSv (calcium score/lung screen)	0.05
10 mSv (coronary CTA/abdomen CT, invasive coronary angiography, radionuclide myocardial perfusion study)[32]	0.5
50 mSv (yearly radiation worker allowance)	2.5
100 mSv (definition of low exposure)	5
Natural fatal cancer[26]	212
Passive smoking[33]	
Low exposure	4
High exposure, married to a smoker	10
Radon in home[34]	
US average	3
High exposure (1% to 3%)	21

AHA Science Advisory

Ionizing Radiation in Cardiac Imaging

A Science Advisory From the American Heart Association Committee on Cardiac Imaging of the Council on Clinical Cardiology and Committee on Cardiovascular Imaging and Intervention of the Council on Cardiovascular Radiology and Intervention

Arsenic in drinking water[35,36]	
2.5 μg/L (US estimated average)	1
50 μg/L (acceptable limit before 2006)	13
Motor vehicle accident[37]	11.9
Pedestrian accident[37]	1.6
Drowning[37]	0.9
Bicycling[37]	0.2
Lightning strike[37]	0.013

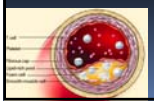
CTA indicates CT angiogram.
National Safety Council estimates are based on data from National Center for Health Statistics and US Census Bureau. Deaths are classified on the basis of the Tenth Revision of the World Health Organization's *International Classification of Diseases*. Lifetime odds are approximated by dividing the 1-year odds by the life expectancy of a person born in 2005 (77.8 years).

TC Gerber et al. *Circulation*. 2009;119:1056-1965

- Major advantage of CTA is its high negative predictive value
  - *A negative test (normal CTA) has a 98% chance of revealing normal coronary arteries on invasive angiography*
- Multi-slice CT ***not*** likely to replace conventional angiography

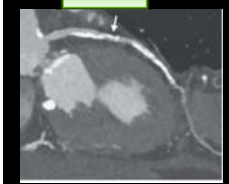
Anatomic versus functional testing

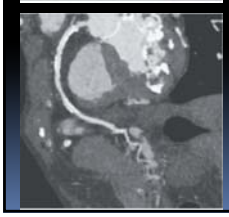
Anatomical testing	Functional testing
• CTCA	• Exercise tolerance testing
• Coronary angiogram	• Dobutamine/exercise stress echocardiogram
	• Myocardial perfusion scan
	• SPECT scan
	• Perfusion cardiac MRI
	• CT-FFR
	• FFR/iFR (invasive)



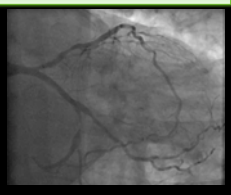
Anatomical testing

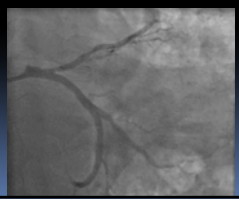
CTCA

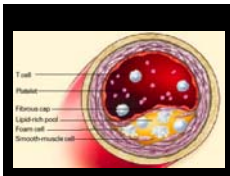




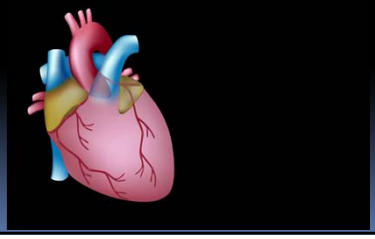
Coronary angiography







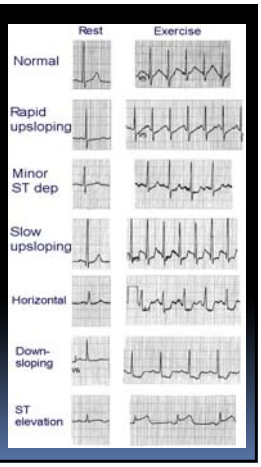
Functional testing



Exercise ECG

- Sensitivity ~ 45-50%
- Specificity ~ 85%
- Markedly influenced by:
  - Population studied
  - Diagnostic criteria
- Test performs worse in women than in men

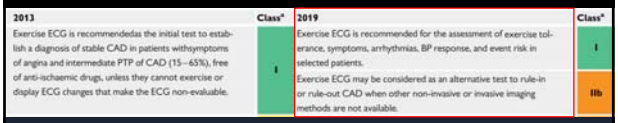
- Contra-indications
  - AS
  - LBBB
  - Uncontrolled severe HTN



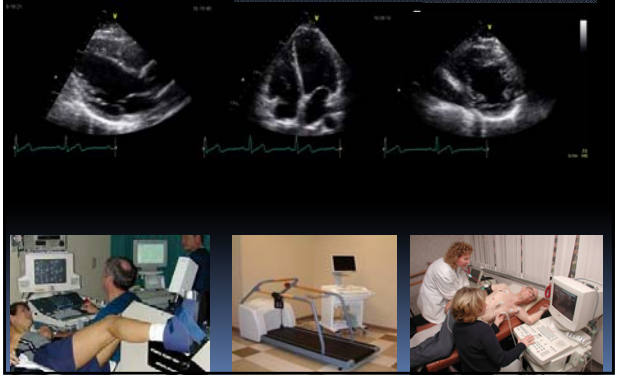
NICE Guidelines Stable Angina 2010

Key priorities for implementation: stable chest pain

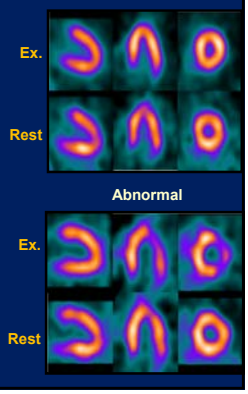
- Use clinical assessment, ECG results and typicality of anginal pain features to estimate the likelihood of CAD. Arrange further diagnostic testing.
- Do not use exercise ECG to diagnose or exclude stable angina for people without known CAD.



Stress Echocardiogram



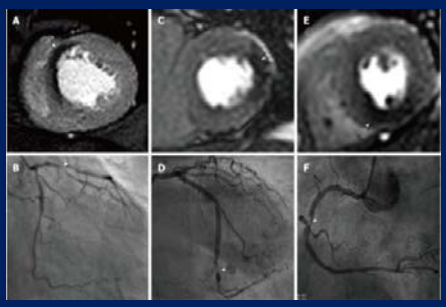
Chest Pain



Tc-99m sestamibi used most frequently

Myocardial perfusion assessed:
- Immediately after stress
  - exercise, adenosine, dipyridamole

Perfusion cardiac MRI scan



Comparison of different Screening tests

Table 12 Characteristics of tests commonly used to diagnose the presence of coronary artery disease

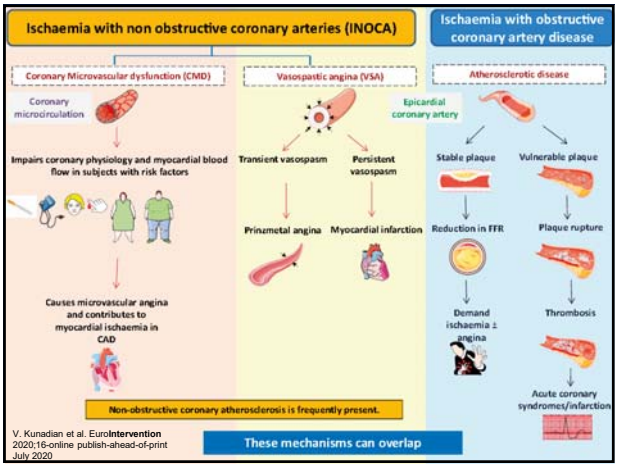
	Diagnosis of CAD	
	Sensitivity (%)	Specificity (%)
Exercise ECG [a, 91, 94, 95]	45–50	85–90
Exercise stress echocardiography[96]	80–85	80–88
Exercise stress SPECT[96,99]	73–92	63–87
Dobutamine stress echocardiography[96]	79–83	82–86
Dobutamine stress MRI[b,100]	79–88	81–91
Vasodilator stress echocardiography[96]	72–79	92–95
Vasodilator stress SPECT[96,99]	90–91	75–84
Vasodilator stress MRI[b,96,100–102]	67–94	61–85
Coronary CTA[c,103–105]	95–99	64–83
Vasodilator stress PET[97,99,106]	81–97	74–91

CAD = coronary artery disease; CTA = computed tomography angiography; ECG = electrocardiogram; MRI = magnetic resonance imaging; PET = positron emission tomography; SPECT = single photon emission computed tomography.
[a] Results without/with minimal referral bias.
[b] Results obtained in populations with medium-to-high prevalence of disease without compensation for referral bias.
[c] Results obtained in populations with low-to-medium prevalence of disease.

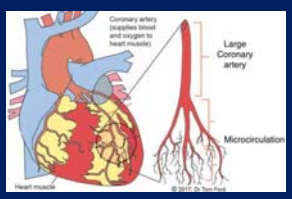
ESC 2013

Myocardial Ischaemia with Non Obstructive Coronary artery Disease (INOCA)

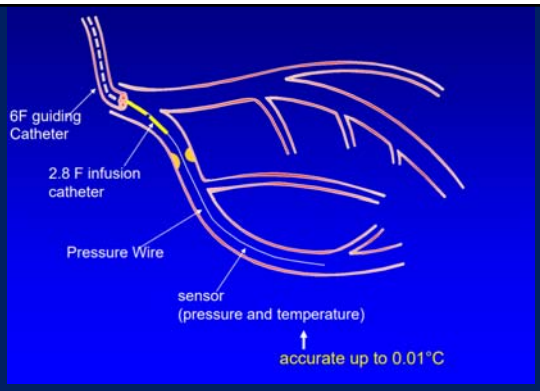
Myocardial infacrction with non obstructive coronary artery disease (MINOCA)



INOCA

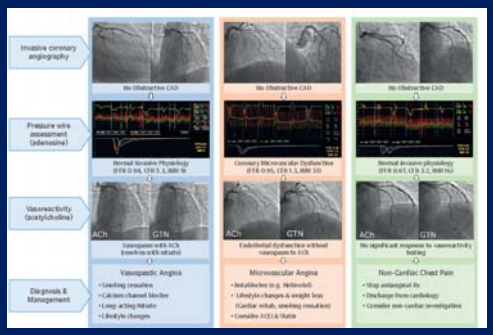


V. Kunadian et al. EuroIntervention 2020;16-online publish-ahead-of-print July 2020



FFR, iFR, RFR
Coronary flow reserve (CFR)
Index of microcirculatory resistance (IMR)

Stratified Medical Therapy Using Invasive Coronary Function Testing in Angina
The CorMicA Trial



T Ford etal. JACC 2018;72:2841

T Ford, Colin Berry. Heart 2020;106:387-398

Case 1

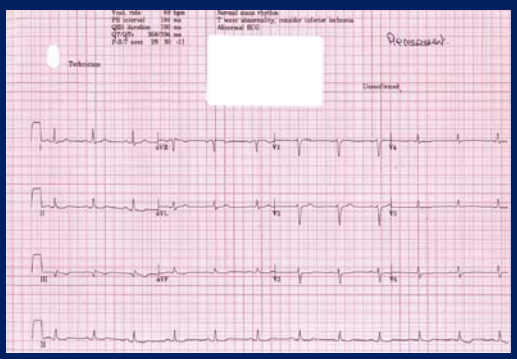
Lister Hospital Rapid Access Chest Pain Clinic
Summary of clinic attendance

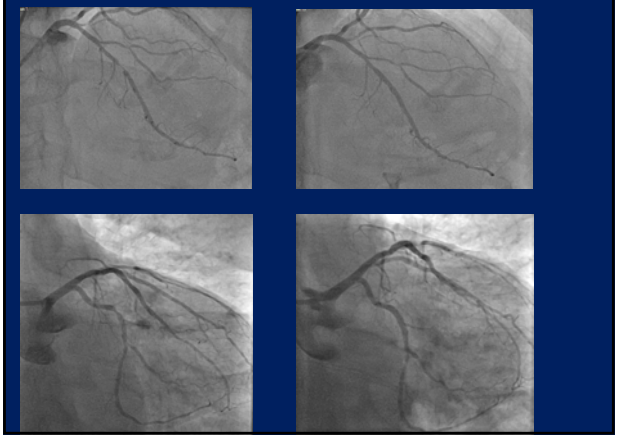
Date of Clinic 18/10/2013 Referred 14/10/2013 For the attention of Dr

Patient Details	73yr Female
Presenting Symptoms	Went to the gp and mentioned she was getting chest tightness. 3-4 year history away occurred on activity until recently where she has woken up with same symptoms in the morning, for the last month. Doesn't radiate to the neck arm nor jaw, takes about 30 minutes to resolve. Described as a inner tightness, not burning.
Blood Results	Hb 129 Chol 7.6 HDL 1.32 LDL 5.24 Trig 2.28 Gluc 5.9 na 136 K 4.6 Creat 80
PMH	Nil
Family History	Brother MI 48 Mother angina Grandmother angina
Medication	Propanolol 80mg Aspirin 75mg od GTN Omeprazole 20mg
Examination	Blood Pressure 146/79 Heart sounds diastolic murmur
Investigations	ECG – NSr rate 73bpm flat V3
Diagnosis	? angina
Risk Factors	**Prediction of CHD in a patient presenting with non-acute chest pain:** Chest pain categorised as: atypical chest pain Probability of significant CHD (ACC/AHA): 74% Probability of significant CHD (Duke): 33%
Change of medication	**Atorvastatin 40mg od**
Management Plan	Diet, lifestyle & risk factors discussed. Leaflets given.
Follow up	Angiogram 1:1000 risk MI, death, CVA

Dr A Ghuran
Cardiologist

kylie murray
Cardiology Specialist Nurse ext 4489





Case 2

Lister Hospital Rapid Access Chest Pain Clinic
Summary of clinic attendance

Date of Clinic 23/8/2013 Referred 9/8/2013 For the attention of Dr Goodwin

Patient Details	70yrs R[redacted] rides AE
Presenting Symptoms	Recurrent chest pain at rest but normally when very stressed not on exertion. Normally described as a tightness that radiates down the left arm lasted all day and at times on and off for the 3 days. Has had this for many years seen mike but never investigated or treatment started, can have short lived pains every day especially when stressed. No chest pain on exertion only mild SOB Daughter and son in law doctors at UCLH
Blood Results	Na 142 U 4.9 Creat 62 Chol 6.0 HDl 1.53 Trig 1.04 LDL 4.0 Gluc 4.6
PMH	Glaucoma Arthritis Never smoked
Family History	Mother – RIP heart attack 69 mother had angina prior to that Grandmather- MI 66yrs
Medication	Eye drops
Examination	Blood Pressure 112/69mmhg Heart sounds normal
Investigations	ECG – NSR rate 52bpm nil changes
Diagnosis	Atypical chest pain
Risk Factors	**Prediction of CHD in a patient presenting with non-acute chest pain:** Chest pain categorised as: atypical cp Probability of significant CHD (ACC/AHA): 64% Probability of significant CHD (Duke): 27%
Change of medication	**Aspirin 75mg od**
Management Plan	Diet, lifestyle & risk factors discussed. Leaflets given.
Follow up	CTCA

Dr A ghuran
Cardiologist

kylie murray
Cardiology Specialist Nurse ext 4489

Cardiac CT

Conclusion:
1. Calcium Score: 0 (< 25 percentile)
2. Coronaries: no significant stenosis.
3. Mildly dilated ascending aorta.

Case 3

Re:

Past Medical History: Ex-smoker

Medications: Omeprazole 20 mg od.

Blood Results: Cholesterol 5.3, HDL 1.29, triglycerides 1.63, LDL 3.27.

Thank you referring this lovely 63-year-old gentleman to Rapid Access Chest Pain Clinic [redacted] tells me he has been experiencing exertional chest tightness over the last 18 months however this is progressively getting worse over the last few months. His chest tightness rapidly eases with rest and at times has radiated down the left arm. He denies any symptoms at all on exertion.

Family History: His father had angina and heart attack in his 60s and died at 72, grandfather had a heart attack in his 80s and two paternal uncles had heart attacks in their 70s.

On examination: blood pressure 140/87 mmHg. Heart sounds are normal, ECG is a left bundle-branch block rate of 68 beats per minute. His Duke's score is 94%.

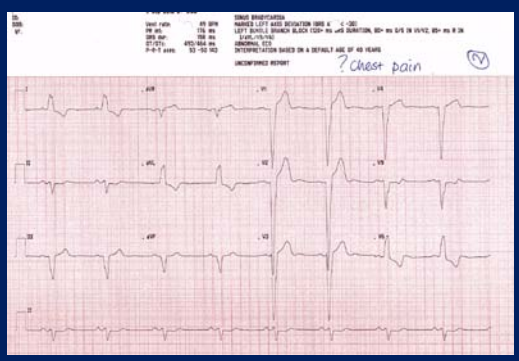
On discussion with Dr Azad Ghuran he agrees that this sounds that Mr [redacted] had been experiencing exertional angina and should be further investigated. I have offered him an angiogram and quoted a 1:1000 risk of death, MI, stroke, bleeding then may require surgery which he has accepted.

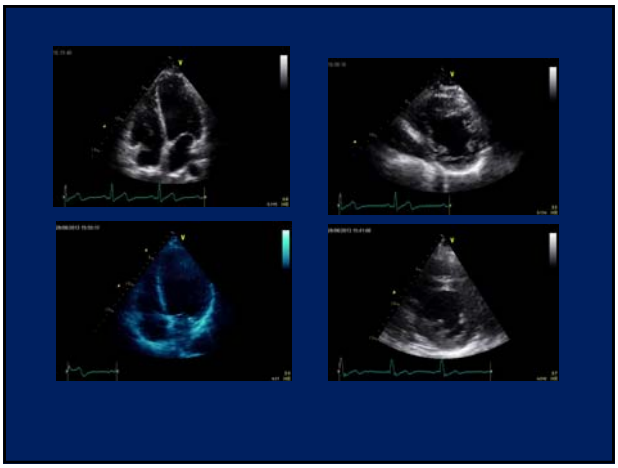
I have prescribed him aspirin 75 mg once daily, bisoprolol 2.5 mg once daily and simvastatin 40 mg once daily on top of his existing medications.

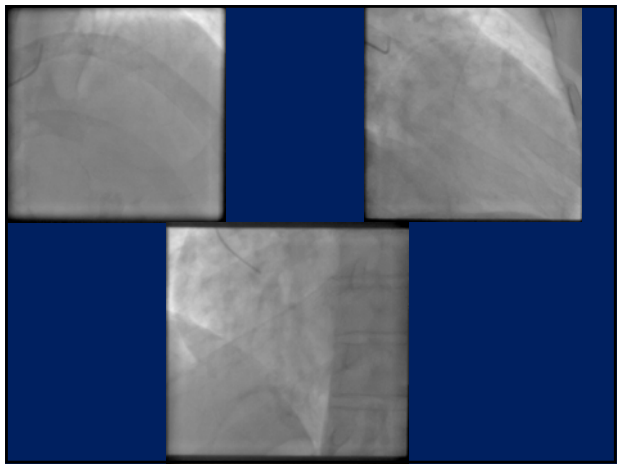
I will also request an echocardiograph as he does have a left bundle-branch block. When he had his hip surgery two years ago he was told there was a rhythm problem on his ECG but no mention of a left bundle. I can only assume the left bundle may be new.

He will be seen at the time of his coronary angiogram and understands that future treatment will depend on the angiogram result. I have explained how to use the GTN spray and advised Mr Howard if he gets prolonged chest discomfort not eased by GTN he should seek urgent medical attention.

Yours sincerely,







Coronary artery bypass surgery x 3 grafts
LIMA to CX
RIMA to LAD
SVG to RCA

7 months later Left ventricular function; severely → moderately impaired. Asymptomatic.

I reviewed Mr Howard today in the Heart Function Clinic. He tells me he has been feeling very well lately. He is able to do many things that he was unable to complete last September such as climbing hills and running upstairs. Overall he feels that there are few restrictions from his health at present. He is still aware of his limitations and his wife is also very careful to avoid him during too much heavy work but I have reassured him today that he is making an excellent recovery and that his echocardiogram confirms a considerable improvement in his left ventricular function.

Re: [redacted] **53 Male**

Past Medical History:
1. Reflux
2. Anaemia

Medication: Aspirin 75mg od.

Family History: Father died from MI age 49.

Thank you for referring Mr Walcott to the Rapid Access Chest Pain Clinic. Approximately two months ago he experienced left-sided chest heaviness at rest a couple of days later he was involved in side on car collision since then he has experienced a constant left-sided chest heaviness radiating to the left shoulder blade and left arm. Pain is exacerbated on upper body movement and exertion. Area is tender to palpate and reproduces the same pain. He also experiences tingling in his left hand and arm. He states the pain can occur on exercise and is associated with shortness of breath.

I discussed with Mr Walcott the symptoms he describes are non-cardiac and are more likely musculoskeletal but he remains very concerned that this is his heart as he cannot play football without experiencing the symptoms.

On examination ECG shows sinus rhythm at 63 beats per minute. Blood pressure 127/62. He has normal heart sounds.

Blood Results: Hb 127, cholesterol 3, HDL 0.91, LDL 1.72, triglycerides 0.82, albumin 31, bilirubin 5, alkaline phosphatase 1, ALT 42.

I have given him a blood form to have up-to-date U&Es today. In view of his ongoing symptoms and s anxiety regarding the pain I have requested a CT coronary angiogram for completeness.

I have discharged from any further cardiology follow-up.

Yours sincerely,

Case 3A

I recently reviewed Mr Walcott in the Rapid Access Chest Pain Clinic with non-cardiac sounding chest pain but in view of the ongoing symptoms and his anxiety I decided to investigate further with CT coronary angiogram. The CT coronary angiogram shows no significant coronary artery disease. On the non-cardiac finding it shows multiple lucent lesions in the ribs, left scapula and sternum several of which have broken through the cortex and consequently highly suspicious of multiple metastases or myeloma there is also a focal area of pleural thickening on the left but this has not been completely covered.

Case 4

Case 4

Blood Results: Hb 160, sodium 138, potassium 4.3, urea 4.8, creatinine 77, eGFR greater than 60, cholesterol 6.6, HDL 1.20, LDL 5.05, triglycerides 0.78.

Past Medical History: Current smoker.

Family History: Father had a heart attack at 47.

Current Medications: Aspirin 75 mg od and GTN spray.

Thank you for referring this young 35-year-old man to Rapid Access Chest Pain Clinic. Marc states 2-3 weeks ago when walking to work he had three separate occasions where he noted he had pain in his epigastric area radiating into his abdomen and felt breathless. This pain lasted a few minutes but was associated with an ache in both arms. The main thing he felt was he had to stop walking because he was more out of breath than he expected. However over the last week these symptoms have completely resolved. He enjoys metal detecting and can be on his feet for 6 hours at the time digging up his what he finds and he is unable to reproduce any symptoms at all.
He also feels like his bowel habits have changed. It can take 2 or 3 days between motions and feels that certain foods are giving him more indigestion symptoms. He did try the GTN once which had no effect on his symptoms.

On examination: blood pressure 136/86 mmHg, heart sounds are normal, ECG is sinus rhythm rate of 49 beats per minute with no ischaemic changes.

I have spoken to Dr Ghuran regarding this man's symptoms. He is very young and has some atypical elements to his pain however these symptoms were on exertion. He feels he should be risk stratified with the treadmill test and commenced on Atorvastatin 20 mg once daily for his cholesterol profile and Lansoprazole 30 mg once daily to see if this alleviates symptoms further. Dr Ghuran will then review him in clinic to see if any further investigations are warranted. Mark is happy with this plan I have reassured him he should go back to the gym and start doing some further exercise. He has been discharged from any Nurse-Led Clinic.

Yours sincerely,

Case 4

REST: SINUS RHYTHM WITH T WAVE FLATTENED IN LEAD III, HR 74 BPM. BP 141/85MMHG.

EXERCISE: FULL BRUCE PROTOCOL.
PATIENT EXERCISED FOR 13:29 MINUTES, ACHIEVING 85% OF MAXIMUM HR.
TEST STOPPED AT PATIENT REQUEST DUE TO FATIGUE.
NO CHEST PAIN. ON THE 2ND STAGE OF EXERCISE T WAVE STARTED TO INVERT AND ST STARTED TO DEPRESS AS AN HORIZONTAL/SQUARE SHAPE IN LEADS II,III AND AVF AND REMAINED INVERTED THROUGHOUT THE TEST AND REACHING MAXIMUM OF 1,5/2 MM OF ST DEPRESSION ON THESE LEADS. BY THE END OF THE 3RD STAGE ST STARTED TO DEPRESS ASWELL ON LEADS V4-V6 REACHING ITS MAXIMUM OF 2MM ON LEAD V5 (INFERO-LATERAL CHANGED). IT WAS ALSO NOTED AN APARENT DISCRET ST ELEVATION OF 0,5MM ON LEAD AVR.
NO EXERCISE INDUCED ARRYTHMIAS. NO VE'S OR SVE'S SEEN.
NO AV OR IV CONDUCTION ABNORMALITIES.
NORMAL TENSIONAL AND CHRONOTROPIC RESPONSES.

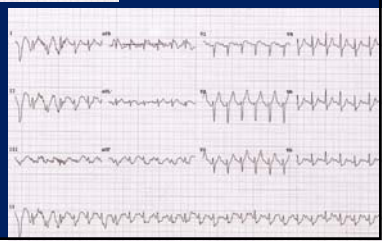
RECOVERY: ECG CAME BACK TO BASELINE.

EMAILED DR. GHURAN ABOUT IT.

Protocol	: Lister Bruce	Test Type	: Treadmill
Exercise Time	: 13:29	Stopping Reason	: Fatigue
		MTWA Result	: -- ()
Max HR	: 157 (Stage 5 01:25)	Max. BP	: 190 / 81
% of Predicted	: 85 % of 185	Max. Exercise	: 16.3 METS
Peak RPP	: 298	Max. ST Depression	: 3.2 mm in III (Stage 5 00:12)
Impressions	:		

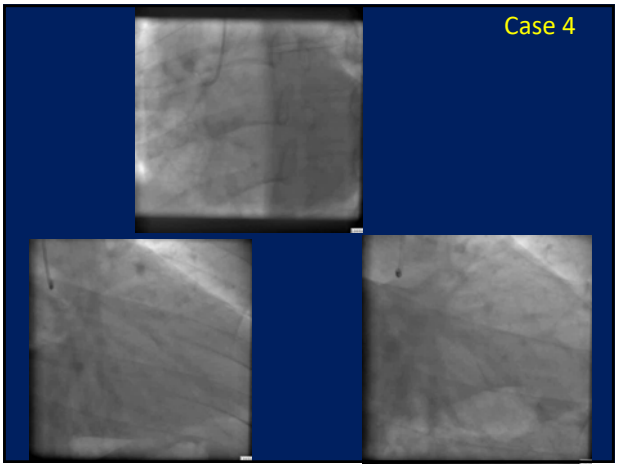
Case 4

At rest



Peak Exercise

Case 4



Case 5A

54 year old female

I reviewed this lady in the Chest Pain Clinic. She gives a history of 3-4 months of chest tightness in her left upper chest sometimes in her left upper arm and jaw. There were no particular precipitating or relieving factors and she tells me she has osteoarthritis in her neck. She has also had a couple of episodes of pain around the xiphisternum but I note that she takes Naproxen regularly with Omeprazole for her osteoarthritis pain in her neck.

She has previously had three ablations for accessory pathways, her ECG currently shows a right bundle-branch block.

She is an ex-smoker of two months ago, she is known to be hyperlipidaemic with a total cholesterol of 6.3 with a ratio of 4 and a Qrisk of 2.9%. Her father had coronary artery bypass graft in his 70s.

She is clearly concerned that her chest pain may be related to coronary disease although I have reassured her that I think this is entirely unlikely. In view of her clear concern I am organising for her to have a CT coronary angiogram and will write to you with the results of this.

I have not made any further arrangements to see her to be seen in this clinic.

Yours sincerely,

Senior Cardiac Specialist Nurse

Ca score 37 Agatston units, mild plaque in the right coronary artery.

Primary prevention

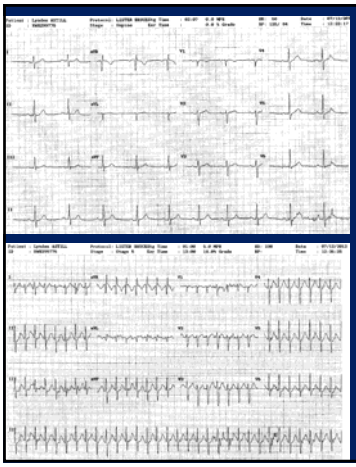
Case 4A

Date of Clinic 07/12/2012 Referred 22/11/2012 For the attention [redacted]

Patient Details	[redacted] Age 44,
Presenting Symptoms	Over several months has experienced squeezing localised left sided chest pain occurring randomly. Over the last month feels the symptoms are now exertional. Started taking Aspirin symptoms resolved now stopped aspirin is experiencing left sided chest tightness on exertion lasting hours. Had pain this morning while cycling to hospital.
Blood Results	Normal FBC, Egfr >60ml/min Cholesterol 5.9 HDL 1.90 LDL 3.37 Tri 1.38 Sodium 142 Potassium 4.3 Urea 5.5 Creat 89
PMH	Nil
Family History	Father PCI aged 63
Medication	Nil
Examination	Blood Pressure 125/84 Pulse 69 No murmurs detected
Investigations	Exercise Tolerance Test ECG – Sinus Rhythm @ 60bpm
Result of exercise test	13 minutes Max HR 191 109% of predicted Max BP 186/108 METS 17.2 Test stopped due to achieving maximum heart rate. Had chest pain before exercise which did not get worse. No significant ST changes.
Diagnosis	Six month history of chest pain. Managed a good work load on the treadmill with no ECG changes. Following discussion with Dr Ghuran we feel the way forward is a CT coronary angiogram.
Risk Factors	**Prediction of CHD in a patient presenting with non-acute chest pain:** Chest pain categorised as: Non-angina Probability of significant CHD (ACC/AHA): 12.3% Probability of significant CHD (Duke): 8.2%
Change of medication	Nil
Management Plan	Reassured.
Follow up	Discharged from clinic. CT coronary angiogram results to follow.

Dr Ghuran, Consultant Cardiologist — Sharon Jones, Cardiology Specialist Nurse ext 4489

Case 4A



Calcium score = 0

70% stenosis in the proximal LAD

Case 4A

4x14mm Biomatrix stent

Case 5 66 year old female

Dear Dr Ghuran

[redacted] Feb 2011

Diagnosis: Familial hypercholesterolaemia – baseline cholesterol 9.9, LDL-cholesterol 7.6
History of premature cardiovascular disease (mother had MI aged 66)
Chest pain on exertion
Previous intolerance to Simvastatin 20 mg – abnormal LFT's

I would be grateful if you would review this lady who has familial hypercholesterolemia and a family history of premature cardiovascular disease (her mother passed away of an MI aged 66 and she was not a smoker). She now experiences chest tightness which may have been present for some time however she is now more aware of her symptoms. The pain does not radiate and she experiences this more on exertion. In light of her family history and longstanding hypercholesterolemia which only received treatment in the last 2 years I would be grateful for your expert review.

Best wishes,

Yours sincerely

Dr A Viljoen MBChB MMed FRCPath FCPath MBA
Consultant Chemical Pathologist
Hon Consultant – Cambridge University Hospitals NHS Foundation Trust

Oct. 2013. TC = 4.7mmo/l, HDL 1.17mmol/l, LDL 3 mmol/l, TC:HDL raio 4, TGL 1.09

Rosuvastatin 5 → 10mg

Case 5

Dear Adie

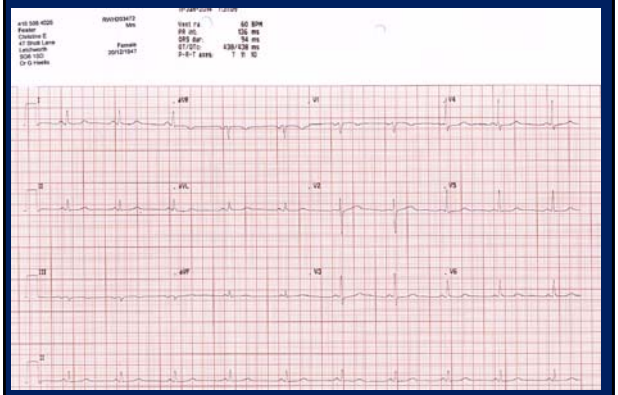
Re: [redacted]

Thank you very much for referring this lady with a history of exertional chest tightness. I understand she is now under your care with a family history of hypercholesterolaemia with a baseline cholesterol of 9.9 mmol/l and an LDL component of 7.6 mmol/l. Her mother had a myocardial infarction at age 66. In view of her risk factors I have listed her directly for coronary angiography and I will write to let you know the results.

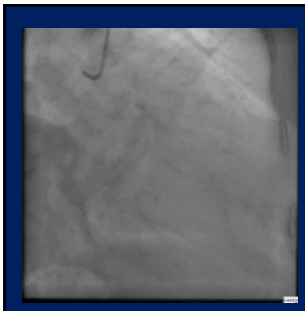
Thanks very much for your referral and should you have any queries please do not hesitate to contact me.

Yours sincerely,

Dr Azad Ghuran MB ChB, MRCP, MD
Consultant Cardiologist



Case 5



Case 5

3 cm papillary lesion adjacent and lateral to the left ureteric orifice.

Transurethral resection of a bladder tumour

Ca

Diagnoses:
1. Hypertension
2. Hyperlipidaemia

70 year old female

Medication: Atorvastatin 20 mg nocte, Amlodipine 5 mg od, Ramipril 10 mg od.

Family History: Father died MI age 77.

Thank you for referring Mrs Barella to the Rapid Access Chest Pain Clinic. She presents with an 18 month history of central chest tightness radiating into the back while walking lasting 2-5 minutes pain eases with rest. She can continue walking pain stays the same until she stops. There are no associated symptoms she can have several episodes per week always on walking, had tightness walking to clinic today.

I discussed with Margaret the symptoms she describes are suggestive of angina and we will need to investigate further with coronary angiography I have provided a patient information leaflet and quoted 1 in a 1000 less than 1% heart attack, stroke, death, vascular complications or renal impairment.

I prescribed Aspirin 75 mg od, Bisoprolol 1.25 mg od, GTN spray 1-2 as required. I have discussed the management of chest pain and the use of GTN spray. I have given Margaret a blood form to have FBC, U&E, LFTs and lipids checked today as she had them recently done at her GP and we do not have any results on the system.

Blood results Normal FBC/U&E/LFT's, Cholesterol 3.2 HDL 1.45 LDL 1.27 Tri 1.05

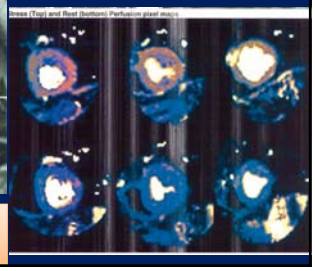
On examination ECG showed sinus rhythm at 80 beats per minute. Blood pressure is 130/65. She has normal heart sounds and no ankle oedema.
Duke score of probability significant CHD 65.7%, Qrisk 13.5%.
I discussed her case with Dr Ghuran, Consultant Cardiologist symptoms suggestive of angina and feels the way forward is coronary angiography and primary prevention.

She will be reviewed again at the time of her angiogram.

Yours sincerely,

The procedure was carried out using a right transradial approach. The LAD and circumflex arteries had to be separately intubated. There was mild diffuse atheroma throughout the left anterior descending artery with no significant disease. There is mild atheroma in the circumflex artery which was a dominant vessel and was unobstructed. The right coronary artery was a moderate sized vessel and essentially non-dominant. She has good left ventricular systolic function and no gradient across the aortic valve.

This lady gives a good history of exertional chest tightness relived with rest although she has no significant flow limiting lesions in her coronary anatomy. I do wonder whether she may have microvascular angina. I will refer her to have a cardiac MRI scan. I will also arrange to review her in clinic. I would suggest she continues on her current medication.



Global subendocardial stress induced perfusion defect consistent with microvascular dysfunction

Conclusion – IHD Chest Pain

- Good history is essential
- Remember limitations of each test (false +ve and false –ve)
- CTCA is a good non invasive tool but has a small associated radiation risk
- Functional tests detect and quantify myocardial ischemia and does not tell us about the development of CAD

Assessment of Chest Pain

Azad Ghuran MB ChB (Edin), MRCP, MD (Edin), FESC
Consultant Cardiologist

www.hertslondoncardiology.co.uk