

## PALPITATIONS & ARRHYTHMIA MANAGEMENT

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[www.hertslondoncardiology.co.uk](http://www.hertslondoncardiology.co.uk)

## Palpitations

### Definition:

'an awareness of ones heartbeat that is thought inappropriate to the circumstances'

## Diagnostic pathway

- History
- Examination
- Resting ECG
- ECG with symptoms
- Additional investigations

## History

- Frequency
- Onset / offset characteristics
- Perceived rate - slow, fast, very fast/rapid
- Characteristics - regular or irregular
- Duration
- Associated symptoms- SOB, sweating, dizziness, hot, pre-syncope, syncope
- Aggravating / relieving factors

## History – RED FLAGS

- Alarm features (Referral indicated)
  - Exercise induced
  - Associated syncope
  - Chest pain
  - Family history of sudden cardiac death
  - Underlying structural heart disease

## History

- Drug history including OTC medicines
  - Decongestants (ephedrine)
  - Alcohol
  - Caffeine
  - Cardio-active drugs (QT interval ?)
  - Recreational drugs

Thank you very much for referring this pleasant 35-year-old gentleman for your cardiology opinion. For the past two months he feels his heart beating, however when he feels his pulse it is around 70 beats per minute. He also feels "an awareness" in the left chest region. This can progress to a discomfort and is aggravated when he lies on the left side. He swains up to three times a week and walk three miles without any limitations. There is no history of indigestion. There are no risk factors for his ischaemic heart disease. There is no significant caffeine intake.

His past medical history includes wheat allergy and he has borderline coeliac disease. He is on no regular medication.

There is no family history of any significant illnesses.

He drinks up to 10 units of alcohol a week and works as a civil servant. He does not smoke.

On examination: pulse 64 beats per minute, regular. JVP was not elevated. Blood pressure 105/79 mmHg. Heart sounds S1 plus S2. His chest was resonant to percussion and clear on auscultation. There was some non-specific tenderness in the left iliac fossa.

His ECG showed normal sinus rhythm with normal conduction indices and waveform morphology. His ventricular rate was 64 beats per minute.

I suspect Mr. [redacted] describes mainly an awareness of his heart beating rather than true palpitations. For reassurance, I have arranged for him to have a 48-hour tape and an echocardiogram. I agree with you that his chest pain is non-cardiac in origin and I have reassured him that no further investigations are required. If it continues you may wish to consider a proton pump inhibitor. I will review him in due course following his cardiac investigations.

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

Yours Sincerely,

## Examination

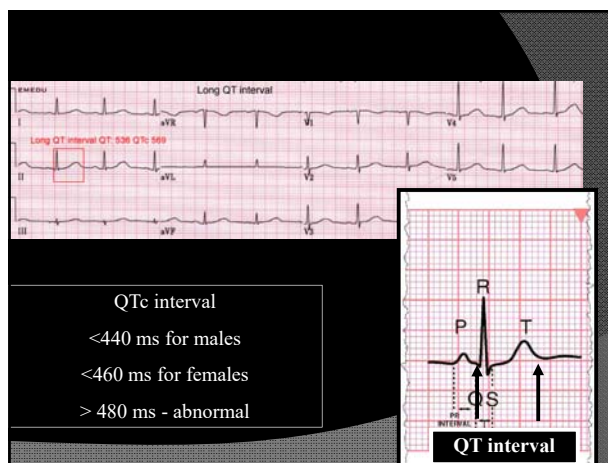
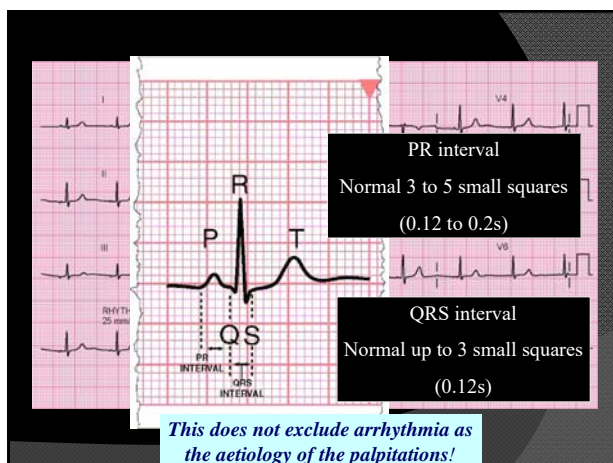
- Cardiovascular
  - Pulse
  - Blood Pressure
  - Heart murmurs
  - Signs of left / right ventricular dysfunction
- Features of endocrine abnormality

## Clinical history and findings with palpitations, and suggested diagnosis

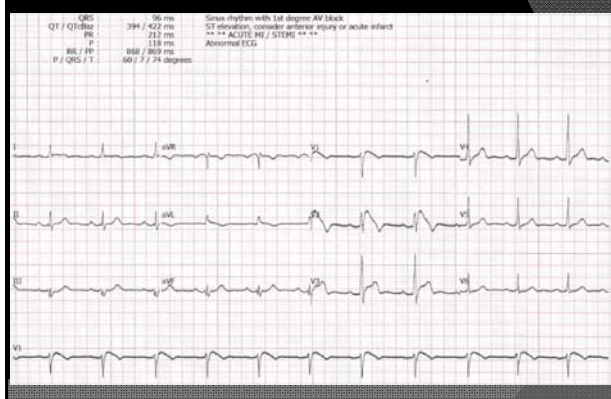
History and findings	Suggested diagnosis
Missed beats, skipped beats, pounding, butterflies in the chest	Ectopy (supraventricular and ventricular ectopics)
Unable to catch breath, need to take a breath, single pounding sensations, a big bang, coughing, fullness in the head, butterflies in the chest, heart is going to burst out of chest	Ventricular ectopics
Rapid, regular pounding in neck	Supraventricular tachycardia (SVT) / atrial arrhythmias
Palpitations worse at night	Ectopy, runs of SVE's, atrial fibrillation (AF)
Palpitations associated with exercise	SVT, VT, IHD
Positional palpitations	SVT/PAF/POT syndrome
Heat intolerance, tremor, goitre	Hyperthyroidism
Palpitations since childhood	SVT
Rapid irregular rhythm, mixture of fast and slow beats	AF
Palpitations terminated with deep breathing, cold drinks, Valsalva, coughing	SVT
Heart murmurs	Heart valve disease
General anxiety	Panic attacks

## Resting ECG

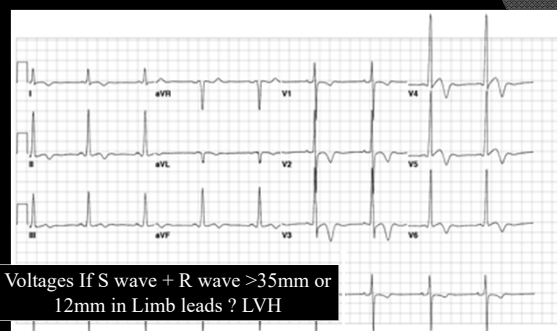
- Features to check
  - Sinus rhythm / arrhythmia
  - PR interval
  - QRS duration
  - QT interval
  - ST segment shape
  - T waves



### Brother's ECG - Brugada syndrome



### HCM



Voltages If S wave + R wave >35mm or 12mm in Limb leads ? LVH

### Additional ECG Investigations

#### ● Capturing an ECG with symptoms

- 12 lead ECG taken with symptoms
- 24 hour = Holter monitoring
- Event recorders/Cardiomemo (patient activated device)
- Exercise testing
- Implantable loop recorder (ILR)- REVEAL
- Electrophysiological stimulation

### The Beginning: 1949 HOLTER Analysis

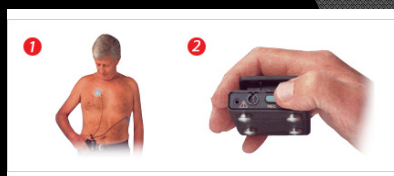
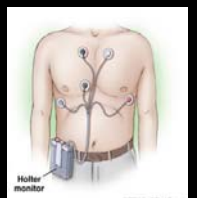


Montana physician  
Dr Norman Jeff Holter



Rocky Mountain Med J  
1949; 747-751

### Holter monitor VS Event monitor





## 24-Holter Analysis in a 39 year old male with palpitations

Day 1 Thursday 21/8/2014

19.28. Standing waiting for food. Light chest palpitation feeling

16.44 standing around light chest palpitation

20.01 standing talking to Partner strong palpitation happened twice (this is a feeling I get randomly and it is the most DISTURBING. On this occasion the feeling was not as strong as I've had it before but the sensation was there anyhow.

21.01 palpitation

21.05 palpitation

21.47. Palpitation mitting down.

Day 2 Friday 22/8/2014

00.55 palpitation strongish, getting passionate about an idea

01.16 strong heart beat. Thinking of sex

01.24 palpitation whilst having sex

22.57 A light strong palpitation.

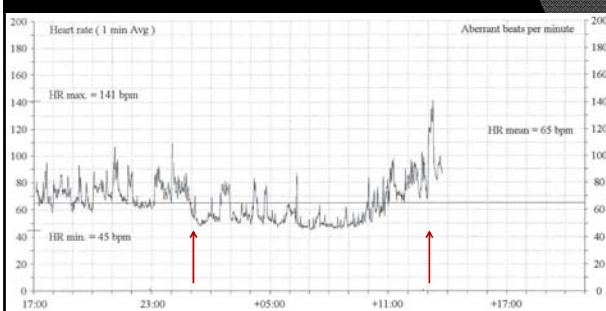
Day 3 Saturday 23/8/2014

00.07 palpitation sex.

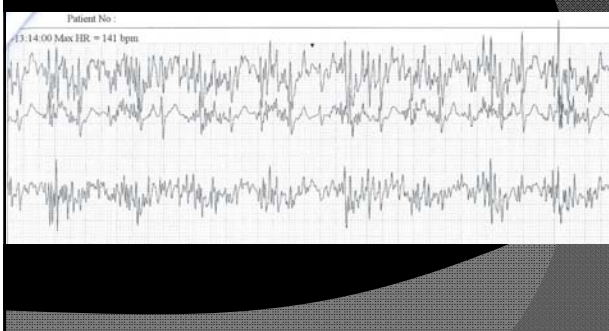
01.01 palpitation strongish lying in bed with Partner

13.06 multiple palpitations until 13.18 having sex on Viagra

## 24-Holter Analysis in a 39 year old male with palpitations



## 24-Holter Analysis in a 39 year old male with palpitations



## Implantable Loop Recorder



Thank you very much for referring this 16-year-old boy for a Cardiology opinion. I understand he has been having palpitation since around 2013. He described his heart as beating very fast and he bought a heart rate monitor which suggest his rates can go up to 200 beats per minute. His palpitations can occur at anytime but has also occurred at the end of exertion. During these episodes, he feels short of breath. His symptoms can last up to 3 minutes. In between these symptoms he is an active gentleman who plays football most days and rides his bike for miles. He describes mild postural symptoms where if he gets up quickly after prolonged sitting he gets a little dizzy.

His past medical history includes tonsillectomy, grommets and a fracture to his left wrist. He is on no regular medication and he denies using any recreational drugs. His paternal grandmother died however his mother was not unable to clarify the age and the cause of death. His maternal grandmother had rhythm disturbance which she was unable to clarify the exact diagnosis.

Joshua lives at home and is in college studying IT. He does not smoke and drinks alcohol occasionally.

Examination was essentially normal. His ECG showed sinus rhythm with a second-degree R-wave in lead V1 and U-waves in leads V2 - V5. The conduction indices are within normal limits specifically his QT interval is normal. His echocardiogram done on the 1<sup>st</sup> April 2015 showed a structurally normal heart.

Symptoms of palpitations occur on an average once a month. I have arranged for him to have a two-week event recorder to see if we can capture his palpitation symptoms. Failing this I have advised him that if his symptoms are prolonged he should attend the nearest A&E or your practice for an ECG. He can also invest in a single channel ECG monitor which I have showed him today in clinic. I have also arranged an exercise tolerance test.

I plan to review him again in three months' time with the results of his investigations.

Yours sincerely,

This patient had symptoms of palpitations and interrogation of his LINQ device showed a narrow complex tachycardia with ventricular rates up to 195 beats per minute. He therefore has a supraventricular tachycardia and I would suggest empirically starting him on Bisoprolol 2.5 mg daily. I will arrange to review him in clinic.

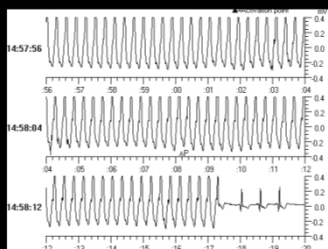
Yours sincerely,

*Dictated and verified by Doctor but not signed*

Dr Azad Ghuran MB ChB, MRCP, MD, FESC  
Consultant Cardiologist

## Case 1

- Reveal device implanted as ECG recordings had not shown anything



28 yo man in the ER multiple times after falls and palpitations resulting in trauma  
VT: ablated and medicated

## Additional Investigations

- Structural abnormalities

Echocardiogram  
Cardiac MRI  
Exercise Tolerance Test  
Cardiac Catheterisation / angiography  
Electrophysiological study

73 year old male

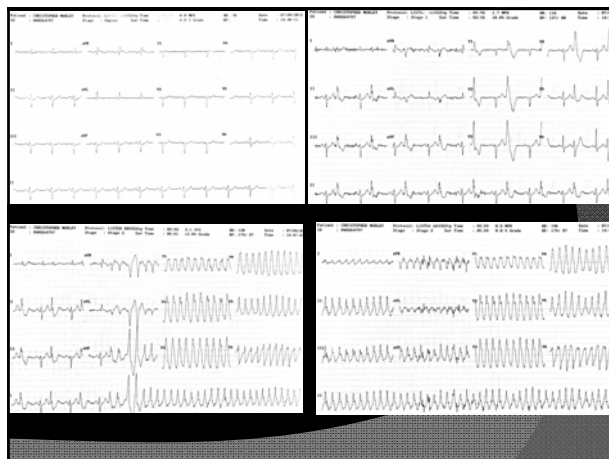
He was admitted on 07/08/2012 following an episode of syncope. He had multiple pre-syncope episodes prior to this. He was previously seen by us following episodes of SOB and presyncopal symptoms on exertion in the absence of chest pain. His ECG at the time was normal and was commenced on bisoprolol 2.5mg for hypertension. His 24 hour tape following this showed a maximum heart rate 67 with a minimum heart rate of 44 bpm. His echocardiogram showed preserved LV systolic function with mildly increased dimensions at 6.2cm and a dilated aortic root and ascending aorta at 5.2cm. He will be having an up-to-date scan.

On this admission it seemed that his symptoms occurred mostly on exertion and we were wondering whether his syncope was a result of the beta-blocker. We thus stopped this and arranged an ETT for exercise-induced arrhythmias. Soon after exercise he developed bigeminy and at 5 1/2 minutes monomorphic VT with a RBBB morphology at 250-300 bpm. He was clearly symptomatic during this (similar to his pre-syncope symptoms). The VT terminated following cessation of exercise.

His angiogram showed mild atheroma with an LV gram confirming a dilated LV and mildly impaired function. His baseline ECG is normal with QRS 105ms.

He has a past medical history of bilateral pleural plaques and a left lower lobe mass on thoracic CT suggestive of folded lung rather than malignancy. He is otherwise fit and well and very much independent.

His electrolytes and rest blood investigations are normal.



## Causes of Palpitations

- Arrhythmias
  - Sinus Tachycardia
  - Ectopics (SVE's / VPC's)
  - SVT – AF / flutter
  - SVT – AVNRT / AVRT
  - VT
- Non cardiac causes
  - Hyperthyroidism, Phaeo, hypoglycaemia, anaemia, pyrexia, dehydration, hypovolaemia
- Psychiatric causes

## Sinus Tachycardia

- Usually of gradual onset
- Perceived rate relatively fast
- Usually gradual termination
- Often described as persistent for several hours or days
- Response to situation

## Sinus Tachycardia

### Investigations

- Postural BP/heart rate
- Blood tests - TFT, FBC, U&E, glucose, catecholamines
- Holter (24-hour analysis)
- Event recorder
- Tilt test

### Treatment

- Reassurance
- Exercise
- Betablockers
- Calcium antagonists
- Ivabradine

### Diagnoses:

- 1 Hypertension
- 2 Palpitations
- 3 Glaucoma
- 4 Right inguinal hernia repair
- 5 Reflux oesophagitis

I reviewed Mr [redacted] today. He still continues to have palpitations at nights which wake him up from sleeping. These are usually associated with nightmares. He has checked his blood pressure and pulse during these episodes. His pulse rate is around 105 beats per minute and blood pressure 170/100/100 mmHg. After walking around and drinking some water his symptoms resolve after 30 minutes. His palpitations symptoms sound more reactive rather than a true underlying arrhythmia.

Thank you very much for referring this pleasant 72-year-old lady for a cardiology opinion. She is currently being considered for possible left total knee replacement surgery. She has been suffering from symptoms of postural palpitations associated with feeling short of breath, which first began during her first pregnancy. These symptoms were initially intermittent, but since 2008 have become persistent on a daily basis.

After standing between 1-15 minutes she feels her heart starts to race, which can be associated with feeling short of breath. If she continues standing, she will start to sweat, feel lightheaded and hot. Her symptoms improve after sitting down. She sweats easily after exertion and has symptoms of feeling bloated with abdominal discomfort. I note she has "a sensitive bladder." She has no symptoms whilst standing practising aqua aerobics.

She has been investigated at the autonomic unit, the National Hospital of Neurology and Neurosurgery, Queens Square in 2015. She had a number of autonomic function tests including a tilt test. The autonomic function testing revealed no significant autonomic failure. During her tilt test, her heart rate increased to 130 beats per minute whilst standing and she was noticed to be hyperventilating which replicated some of her symptoms that she had been experiencing. It was felt that the increase in heart rate was secondary to hyperventilation, although in my opinion this is unlikely. There was no significant change in plasma catecholamines while supine or tilted.

She was investigated by my colleague, [redacted] in 2008/2009, and underwent an echocardiogram and 24-hour ECG. She was also investigated by Dr [redacted], Consultant Respiratory Physician and had normal lung function tests.

Her past medical history includes type 2 diabetes mellitus, a hiatus hernia, ME/chronic fatigue syndrome and she is a heterozygous HFE gene mutation carrier for haemochromatosis. She has previously been

**Notes:** She has had a colonoscopy, endoscopy and was found to be H. pylori positive which was treated.

Her current medication consists of alendronate acid 70 mg daily, canagliflozin 100 mg daily, metformin 15 mg twice daily, sitagliptin 100 mg daily, esomeprazole 40 mg daily, thyroxine 100 mcg on weekends and 75 mcg during the week, rosuvastatin 10 mg daily and hypromellose eye drops.

Susan has two children. She is a retired PE teacher. She does not smoke. She drinks alcohol occasionally.

Examination: pulse 89 beats per minute at rest and regular. Heart sounds S1 plus S2. Her chest was clear. JVP was not elevated.

Lying blood pressure 156/96 mmHg, 156/96 mmHg, and 156/96 mmHg. Pulse and blood pressure standing at 1 minute 108 beats per minute, 150/100 mmHg; at three minutes, 112 beats per minute, 144/102 mmHg; at 7 minutes, 112 beats per minute, 146/102 mmHg; at 8 minutes 114 beats per minute, 138/100 mmHg and at 10 minutes, 120 beats per minute, 144/104 mmHg. She did not hyperventilate whilst standing. She had her typical symptoms of palpitations, which she has experienced in the past.

Her ECG showed sinus rhythm with a ventricular rate of 82 beats per minute with normal conduction indices and waveform morphology.

Based on her examination today, in my opinion I think she has a spectrum of dysautonomia including postural orthostatic tachycardia syndrome. Some of the changes seen today was also seen when she had her autonomic function testing; however, she does not have any significant autonomic failure, but a spectrum of autonomic dysautonomia.

As you are considering orthopaedic surgery, I have arranged for her to have an echocardiogram, 24-hour ECG, 24-hour ambulatory blood pressure monitor and a cardiac CT scan to confirm that she does indeed have a structurally normal heart. I have empirically started her on ivabradine 2.5 mg twice daily to help limit her palpitation symptoms while standing. I will finalise her management following her investigations.

Yours Sincerely,

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

### DIAGNOSES:

1. Probable POT syndrome.
2. Normal cardiac CT with unobstructed coronary arteries.
3. Type 2 diabetes mellitus.
4. Hiatus hernia.
5. ME/chronic fatigue syndrome.
6. Heterozygous HFE gene mutation.
7. Haemochromatosis.
8. Previous H. Pylori positive, which was treated.
9. Normal echocardiogram.

I reviewed Susan today in clinic. I was glad to hear that she feels great, more alert, less tired and thinks more clearly following the addition of Bisoprolol to Ivabradine. She is also able to walk a lot longer and can now walk for up to 20 minutes. She is limited because of knee pain.

Her current medications consists of Adcal-D3, Alendronic acid, Canagliflozin 100 mg daily, Esomeprazole 40 mg daily, Hypromellose Eye Drops, Ivabradine 7.5 mg twice daily, Thyroxine 175 mcg daily, Metformin MR 1 g b.d., Rosuvastatin 10 mg daily, Sitagliptin 100 mg daily and Bisoprolol 1.25 mg daily.

The home blood pressure on average since commencing Bisoprolol is around 129/80 mmHg.

As Susan remains well and has been the best she has been for the past 5-6 years, I would suggest she continues her current medications. If she develops any palpitations whilst standing in future then she can always increase Bisoprolol dose to 2.5mg. She is keen to continue to be followed up and consequently I planned to review her again in 6 months time (11<sup>th</sup> of June, 2021).

Yours Sincerely,

## Ectopics

- Usually of sudden onset
- Perceived as recurrent 'missed beats, heavy beat, a big thump'
- rate relatively slow
- Usually present at rest
- Often described as persistent for several hours or days





Thank you very much for referring this pleasant 58 year old gentleman with a history of palpitations. He started to get palpitations in May which lasted a few days. He describes the sensation like "an electric shock", 'missed beat' and "a flutter" for a few seconds. His symptoms occur sporadically every few weeks. He has no symptoms on exertion and mainly gets them at rest.

He is generally fit and goes to the gym once a week and swims once weekly. He drinks up to two cups of coffee and two cups of teas a day. He drinks between 15-20 units of alcohol a week. I have asked him to reduce both his caffeine and alcohol intake. There have been no recent upper respiratory tract infections.

There is no significant past medical history and he is on no regular medication.

His father died in his fifties with stomach cancer and his mother is still alive aged ninety-one and suffers with hypertension. She also has a pacemaker. He has a younger brother aged fifty-three who suffers with Type II diabetes mellitus.

He lives alone and smokes very occasionally.

## Ectopics

### Investigations

- ⦿ Holter (24-hour analysis)
- ⦿ Event recorder
- ⦿ ETT
- ⦿ CTCA/Coronary angiogram
- ⦿ Cardiac MRI

### Treatment

- ⦿ Reassurance
- ⦿ Betablockers
- ⦿ Calcium antagonists
- ⦿ Rarely antiarrhythmic drugs
- ⦿ Ablation

Thank you for discussing [redacted] with me following your assessment at the Pre-Assessment Clinic.

Mr [redacted] is currently under the care of Mr [redacted] Consultant Urologist and is due to for a ureteroscopy +/- laser, +/- removal of stent. This procedure can last up to 2 hours and would require a general anaesthesia. At his last general anaesthesia on the 5<sup>th</sup> of November 2017 he was noted to have intra-operative ECG changes which according to your letter was trigeminy. His blood pressure was low requiring a metaraminol boluses. He was subsequently discharged the following day as he was asymptomatic.

He recently had an echocardiogram which showed normal left ventricular cavity size with good function and no significant valvular abnormalities.

His recent 24-hour ECG showed frequent ventricular ectopics with a ventricular ectopic burden of 18.4%.

His past medical history includes a coronary stent 7 years ago at Basildon Hospital, hiatus hernia and right renal calculi.

His current medication consists of Aspirin 75 mg daily, Bisoprolol 2.5 mg daily and Simvastatin 40 mg daily.

Although I have not formally reviewed this gentleman, following our discussion and your pre-assessment letter I have listed him directly for a coronary angiogram to reassess his coronary anatomy. If this shows no significant stenosis then I would be happy for you to proceed with surgery as planned.

Yours sincerely,

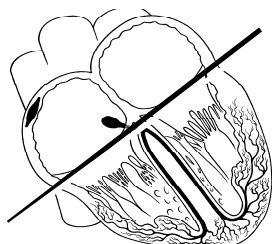
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- Significant triple vessel disease
- Triple coronary artery bypass surgery
- Repeat 24-hour ECG post CABG < 1% VE burden

## Arrhythmias

Supraventricular

Ventricular



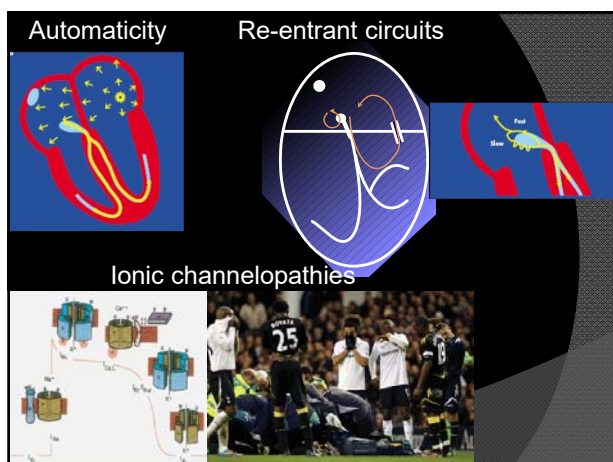
## Arrhythmias

### Tachyarrhythmias Mechanisms

- ⦿ Automaticity
- ⦿ Re-entrant circuits (accessory pathways)
- ⦿ Triggered activity. Ionic channelopathies

### Bradyarrhythmias

- ⦿ AV block, sick sinus syndrome



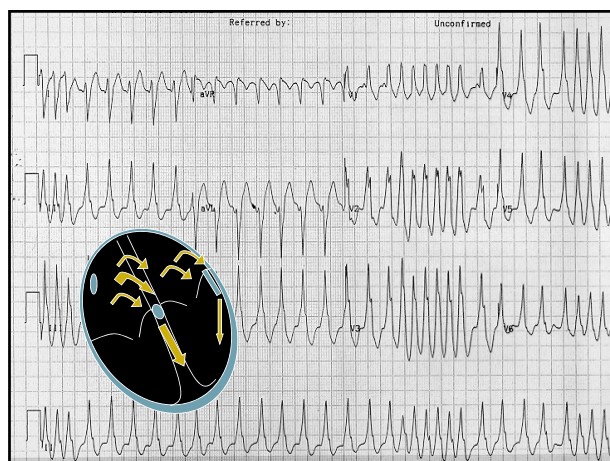
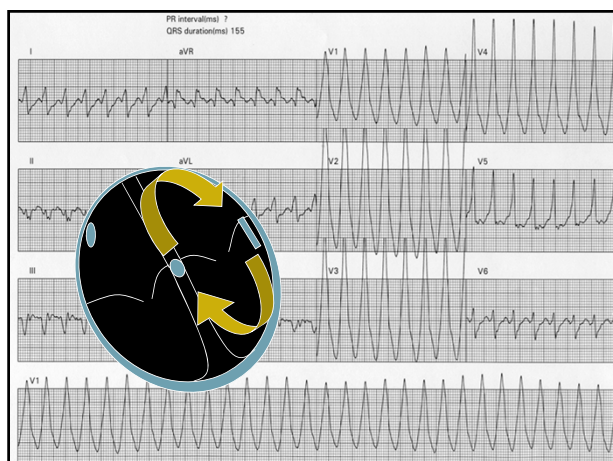
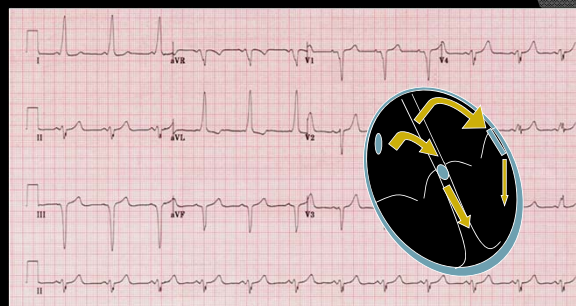
### Supra-Ventricular Tachycardia (SVT)

- Sudden onset and cessation
- Perceived rate rapid (very fast) and regular
- 'Rapid pounding or fluttering in chest'
- 'Pounding or pulsation in the neck'
- Duration variable and vagal manoeuvres are sometimes successful
- Light headed, dizzy, sweaty, chest discomfort, breathlessness, weak, tired, pre-syncope, syncope (elderly)

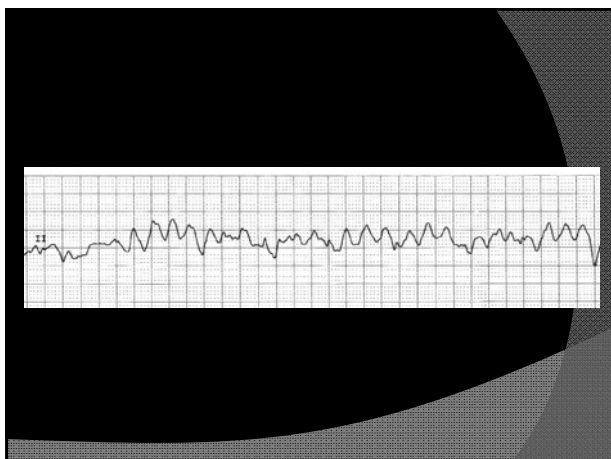
### "SVT" Narrow complex tachycardia

- Terminate arrhythmia
  - Vagal manoeuvres
  - Adenosine
- Pill in pocket vs Regular Rx
- EPS and ablation

### Wolff-Parkinson-White Syndrome







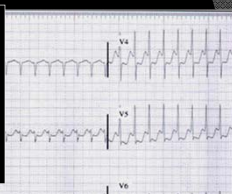
## WPW: Long term management

- ⊙ Risk of sudden death (c. 0.1% per year)
- ⊙ If symptomatic...
  - Ablation treatment of choice
- ⊙ Otherwise
  - Beta-blockade +
  - Flecainide, (Class 1 antiarrhythmic drugs)
- ⊙ If asymptomatic...

## AV nodal re-entrant tachycardia



- 60%+ of SVT, F > M
- Acute termination with adenosine
- Antiarrhythmic prophylaxis
  - Beta-blockade
  - Verapamil
  - Flecainide
- Curable with radiofrequency ablation

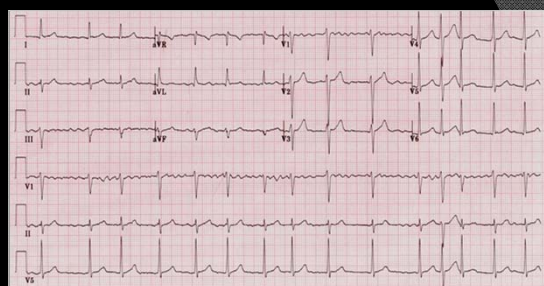


- Success rates 95%
- Risk of AV node damage 1-2%
- Therefore usually when medical therapy failed or unacceptable

## Atrial Fibrillation

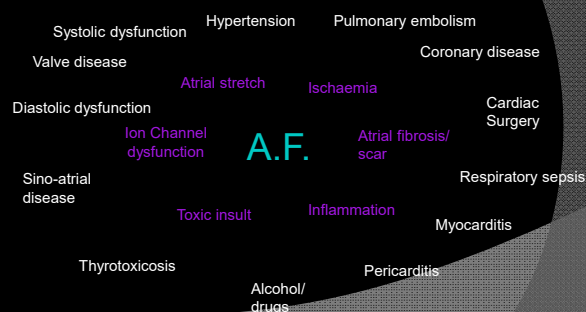
- ⊙ Usually sudden onset
- ⊙ Perceived rate irregular 'fluttering'-mixture of fast and slow beats
- ⊙ Usually sudden termination
- ⊙ Variable duration seconds to days
- ⊙ Light headed, dizzy, chest discomfort (IHD), breathlessness, pre-syncope, syncope (elderly)

## Atrial Fibrillation



A standard 12-lead ECG recording or a single-lead ECG tracing of > 30 s showing heart rhythm with no discernible repeating P waves and irregular RR intervals (when atrioventricular conduction is not impaired) is diagnostic of clinical AF

## Multiple aetiologies



## Classification of AF

AF pattern	Definition
<b>First diagnosed</b>	AF not diagnosed before, irrespective of its duration or the presence/severity of AF-related symptoms.
<b>Paroxysmal</b>	AF that terminates spontaneously or with intervention within 7 days of onset.
<b>Persistent</b>	AF that is continuously sustained beyond 7 days, including episodes terminated by cardioversion (drug or electrical cardioversion) after 27 days.
<b>Long-standing persistent</b>	Continuous AF of >12 months' duration when decided to adopt a rhythm control strategy.
<b>Permanent</b>	AF that is accepted by the patient and physician, and no further attempts to restore/maintain sinus rhythm will be undertaken. Permanent AF represents a therapeutic attitude of the patient and physician rather than an inherent pathophysiological attribute of AF, and the term should not be used in the context of a rhythm control strategy with antiarrhythmic drug therapy or AF ablation. Should a rhythm control strategy be adopted, the arrhythmia would be re-classified as 'long-standing persistent AF'.
<b>Terminology that should be abandoned</b>	
<b>Lone AF</b>	A historical descriptor. Increasing knowledge about the pathophysiology of AF shows that in every patient a cause is present. Hence, this term is potentially confusing and should be abandoned. <sup>147</sup>
<b>Valvular/non-valvular AF</b>	Differentiates patients with moderate/severe mitral stenosis and those with mechanical prosthetic heart valve(s) from other patients with AF, but may be confusing <sup>148</sup> and should not be used.
<b>Chronic AF</b>	Has variable definitions and should not be used to describe populations of AF patients.

AF-related OUTCOMES		
AF-Related Outcome	Frequency in AF	Mechanism(s)
Death	1.5 - 1.5 fold increase	Excess mortality related to: • HF, comorbidities • Stroke
Stroke	20-30% of all ischaemic strokes, 10% of cryptogenic strokes	• Cardioembolic, or • Related to cerebral vascular atheroma
LV dysfunction / Heart failure	In 20-30% of AF patients	• Excessive ventricular rate • Irregular ventricular contractions • A primary underlying cause of AF
Cognitive decline / Vascular dementia	Hb 1.4 / 1.6 (symptomatic of stroke history)	• Brain white matter lesions, inflammation • Hypoperfusion • Thrombo-embolism
Depression	Depression in 16-20% (even suicidal ideation)	• Severe symptoms and decreased QoL • Drug side effects
Impaired quality of life	~40% of patients	• Related to AF burden, comorbidities, psychological functioning and medication • Distressed personality type
Hospitalizations	15-40% annual hospitalization rate	• AF management, related to HF, PE or AF related symptoms • Treatment-associated complications

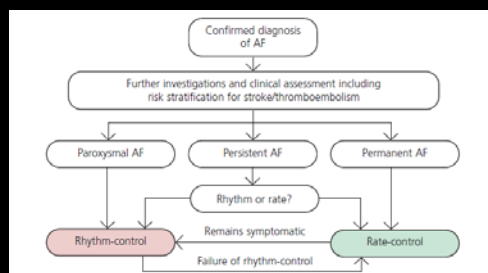
ESC 2020

## Atrial Fibrillation

### Goals of Therapy

1. Relieve symptoms
2. Prevent Stroke
3. Treat underlying disease/Prevent Heart Failure

## NHS National Institute for Health and Clinical Excellence



## Atrial Fibrillation- Rate vs Rhythm

### Rate control plus anticoagulation preferred

- No or lesser AF symptoms
- Longer AF Hx
- More SHD
- Elderly
- Greater risk of proarrhythmia / antiarrhythmic drug toxicity

### Rhythm control preferred

- Greater AF symptoms
- Symptoms despite rate control
- Younger age
- No or lesser SHD
- Rx option of antiarrhythmic drugs

## Acute Therapy

- Is there a precipitating cause?
  - infection
  - ischaemia
  - acidosis
  - hypoxia
  - Surgery
  - Hypothyroidism
- If so, unlikely to maintain sinus rhythm until underlying cause addressed

## Acute Therapy: Cardioversion

Possibility if duration <48hrs

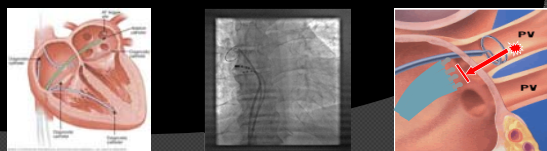
- 50% will revert spontaneously within 24hrs
- Electrically works immediately
- Chemically flecainide 10mg/min iv until 2mg/kg works in minutes  
avoid if LV impairment or prior MI  
iv amiodarone 1200mg/day works in hours  
oral amiodarone works in days/weeks

## AF Ablation

- Success rates 60-80% in experienced hands
- But...
  - Multiple procedures
  - Different definitions of success
  - Short follow up
  - Variable thoroughness of follow up
- Works best in normal hearts with paroxysmal AF

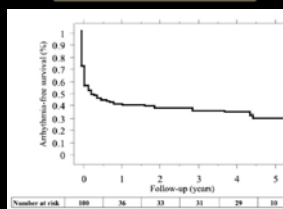
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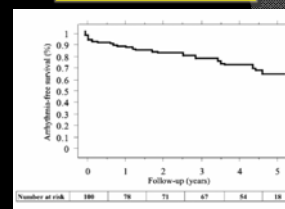


## AF Ablation

Single procedure success



Multiple procedure success



Weerasooriya R et al, J Am Coll Cardiol, 2011 Jan 11;57(2):160-6.  
Catheter ablation for atrial fibrillation: are results maintained at 5 years of follow-up?

## Atrial Fibrillation

- Assess rate control

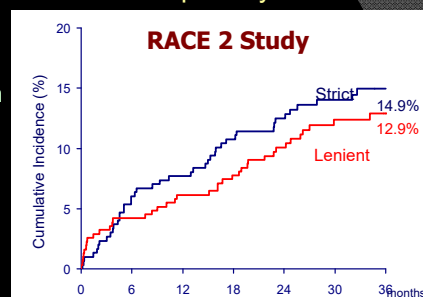
Beta-blockers  
Verapamil/Diltiazem  
Digoxin  
Amiodarone

## Cumulative incidence primary outcome

Lenient  
HR < 110 bpm

Vs

Strict  
HR < 80 bpm



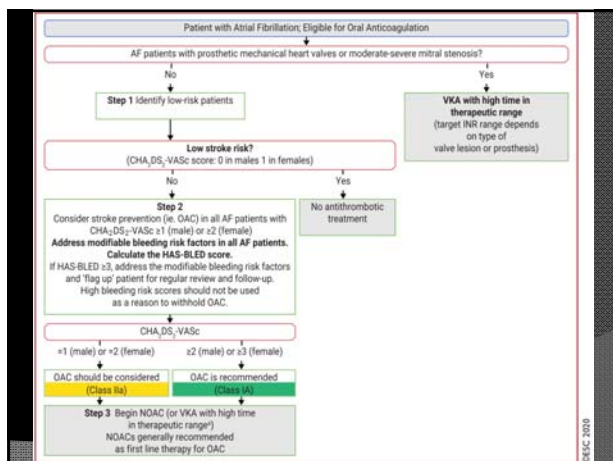
Cardiovascular mortality, Hospitalization for heart failure, Stroke, systemic emboli, major bleeding, Syncope, sustained VT, cardiac arrest, Life-threatening adverse effects of RC drugs, Pacemaker implantation for bradycardia, ICD implantation for ventricular arrhythmias



CHA <sub>2</sub> DS <sub>2</sub> -VASc score		
Risk factors and definitions		
	Points awarded	Comment
<b>C Congestive heart failure</b> Clinical HF, or objective evidence of moderate to severe LV dysfunction, or HCM	1	Recent decompensated HF irrespective of LVEF (thus incorporating HFpEF or HFpEF), or the presence (even if asymptomatic) of moderate-severe LV systolic impairment on cardiac imaging. <sup>163</sup> HCM confers a high stroke risk <sup>164</sup> and OAC is beneficial for stroke reduction. <sup>167</sup>
<b>H Hypertension</b> or on antihypertensive therapy	1	History of hypertension may result in vascular changes that predispose to stroke, and a well-controlled BP today may not be well-controlled over time. <sup>164</sup> Uncontrolled BP – the optimal BP target associated with the lowest risk of ischaemic stroke, death, and other cardiovascular outcomes is 120/129/180 mmHg. <sup>168</sup>
<b>A Age 75 years or older</b>	2	Age is a powerful driver of stroke risk, and most population cohorts show that the risk rises from age 65 years upwards. <sup>169</sup> Age-related risk is a continuum, but for reasons of simplicity and practicality, 1 point is given for age 65–74 years and 2 points for age ≥75 years.
<b>D Diabetes mellitus</b> Treatment with oral hypoglycaemic drugs and/or insulin or fasting blood glucose >125 mg/dL (7 mmol/L)	1	Diabetes mellitus is a well-established risk factor for stroke, and more recently stroke risk has been related to duration of diabetes mellitus (the longer the duration of diabetes mellitus, the higher the risk of thromboembolism <sup>170</sup> ) and presence of diabetic target organ damage, e.g. retinopathy. <sup>161</sup> Both type 1 and type 2 diabetes mellitus confer broadly similar thromboembolic risk in AF, although the risk may be slightly higher in patients aged <65 years with type 2 diabetes mellitus compared to patients with type 1 diabetes mellitus. <sup>162</sup>
<b>S Stroke?</b> previous stroke, TIA, or thromboembolism	2	Previous stroke, systemic embolism, or TIA confers a particularly high risk of ischaemic stroke, hence weighted 2 points. Although excluded from RCTs, AF patients with ICH (including haemorrhagic stroke) are at very high risk of subsequent ischaemic stroke, and recent observational studies suggest that such patients would benefit from oral anticoagulation. <sup>165, 166</sup>
<b>V Vascular disease</b> Angiographically significant CAD, previous myocardial infarction, PAD, or aortic plaque	1	Vascular disease (PAD or myocardial infarction) confers a 17–22% excess risk, particularly in Asian patients. <sup>169, 171</sup> Angiographically significant CAD is also an independent risk factor for ischaemic stroke among AF patients (adjusted incidence rate ratio 1.29, 95% CI 1.08–1.53). <sup>169</sup> Complex aortic plaque on the descending aorta, as an indicator of significant vascular disease, is also a strong predictor of ischaemic stroke. <sup>168</sup>
<b>A Age 65–74 years</b>	1	See above. Recent data from Asia suggest that the risk of stroke may rise from age 50–55 years upwards and that a modified CHA <sub>2</sub> DS <sub>2</sub> -VASc score may be used in Asian patients. <sup>163,162</sup>
<b>Sc Sex category (female)</b>	1	A stroke risk modifier rather than a risk factor. <sup>163</sup>
<b>Maximum score</b>	<b>9</b>	

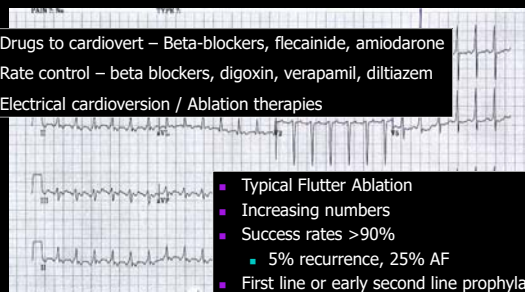
Risk factors and definitions		
	Points awarded	
<b>H Uncontrolled hypertension</b> SBP >160 mmHg	1	
<b>A Abnormal renal and/or hepatic function</b> Dialysis, transplant, serum creatinine >200 µmol/L, cirrhosis, bilirubin > 2 × upper limit of normal, AST/ALT/ALP >3 × upper limit of normal	1 point for each	
<b>S Stroke</b> Previous ischaemic or haemorrhagic stroke	1	
<b>B Bleeding history or predisposition</b> Previous major haemorrhage or anaemia or severe thrombocytopenia	1	
<b>L Labile INR<sup>a</sup></b> TTR <60% in patient receiving VKA	1	
<b>E Elderly</b> Aged >65 years or extreme frailty	1	
<b>D Drugs or excessive alcohol drinking</b> Concomitant use of antiplatelet or NSAID, and/or excessive <sup>b</sup> alcohol per week	1 point for each	
<b>Maximum score</b>	<b>9</b>	

HAS-BLED ≤2, low risk of bleeding  
HAS-BLED ≥3, high risk of bleeding



## Atrial flutter

Drugs to cardiovert – Beta-blockers, flecainide, amiodarone  
Rate control – beta blockers, digoxin, verapamil, diltiazem  
Electrical cardioversion / Ablation therapies



- Typical Flutter Ablation
- Increasing numbers
- Success rates >90%
  - 5% recurrence, 25% AF
- First line or early second line prophylaxis

## Palpitations and Ventricular arrhythmias



- Regular? No → AF/AFL/AT with BBB or AP
- Is QRS identical to that of SR?
  - Yes → SVT with BBB
- A-V dissociation or fusion beats? Yes → VT
- QRS morphology? Bizarre → VT
- Previous MI or structural heart disease? Yes → VT

## Palpitations and Ventricular arrhythmias

- Sudden onset and cessation
- Perceived rate rapid (very fast) and regular
- 'Rapid pounding or fluttering in chest'
- Light headed, dizzy, sweaty, clammy, chest discomfort, breathlessness, weak, tired, pre-syncope, syncope







## Case 3

## Diagnoses:

- 1 Palpitations – need to exclude paroxysmal atrial fibrillation/atrial tachyarrhythmias
- 2 Hypertension
- 3 Trigeminal neuralgia
- 4 Hay fever
- 5 Cervical spondylosis
- 6 Subtotal hysterectomy for fibroids
- 7 Previous varicose vein operation
- 8 CHA2DS2-VASc = 3, HASBLED score = 1

Since this lady was last reviewed three months ago she has had one episode of palpitations two months ago lasting five hours. She described the palpitations as an irregular beat, pauses and a mix of fast beats and was associated with tightness.

Examination: pulse 64 beats per minute, blood pressure 142/58.

I will appreciate if you can increase her Bisoprolol to 2.5mg daily and I will also arrange for her to have a two week event recorder.

Once we have documented that she is having episodes of atrial fibrillation then she will need to be anti-coagulated with warfarin. I have arranged to review her again in three months' time.

## Case 3



## Diagnoses:

- 1 Palpitations – atrial tachyarrhythmias
- 2 Hypertension
- 3 Trigeminal neuralgia
- 4 Hay fever
- 5 Cervical spondylosis
- 6 Subtotal hysterectomy for fibroids
- 7 Previous varicose vein operation
- 8 CHA2DS2-VASc score = 3, HASBLED score = 1

has now had her event recorder during which she had three episodes of heart flutter, two of which correlated with single ectopic beats and the other one showed sinus rhythm. There were asymptomatic episodes of an atrial tachycardia up to eight beats. I am not sure whether her heart flutters are reminiscent of her long episodes of palpitations and I will review the situation when she next attends clinic.

She is predisposed to having atrial fibrillation and should she have any prolonged episodes of palpitations then she knows that she really needs to attend your surgery or the nearest A&E Department for an ECG recording.

In the meantime she should continue with her medication which consists of Bisoprolol 2.5mg daily, Amlodipine 5mg daily, Fexofenadine prn, Omeprazole 20mg daily, Aspirin 75mg daily and Naproxen 500mg prn.

Please feel free to contact me should you have any queries.

Yours sincerely,

## Diagnoses:

- 1 Confirmed paroxysmal atrial fibrillation
- 2 Hypertension
- 3 Trigeminal neuralgia
- 4 Hay fever
- 5 Cervical spondylosis
- 6 Subtotal hysterectomy for fibroids
- 7 Previous varicose vein operations
- 8 CHA2DS2-VASc score = 4 HAS BLED score = 2
- 9 Severe allergic reaction to Carbamazepine, Lisinopril caused a swollen tongue

I reviewed today in clinic. I understand 27<sup>th</sup> February 2011 she had an epistaxis episode which was initially treated at Lister Hospital and her Aspirin was discontinued. She was also noted to be hypertensive and her Amlodipine dose was increased. She subsequently underwent needle cauterisation by Mr Quinn.

On 12<sup>th</sup> April she had palpitations and she went to the A&E department at Lister Hospital where they diagnosed atrial fibrillation and the Bisoprolol dose was increased to 5mg daily. I note some blood tests showed a magnesium of .69 and potassium of 6.7. Because of ankle swelling the Amlodipine dose was decreased to 5mg daily. She has been referred to the anti-coagulation clinic for commencement of Warfarin.

## Case 6

Examination today: pulse 60 beats per minute, regular. Blood pressure 150/64, 147/67, 147/67. Now that her nose has been cauterised I am happy for her to commence Warfarin. Once Warfarin has been commenced her Aspirin can be discontinued.

I will appreciate if you can continue to monitor her blood pressure and if necessary commence an angiotensin blocker and not an ACE inhibitor given her previous reaction to Lisinopril.

ECG today confirmed sinus rhythm. I reviewed her ECG from 12<sup>th</sup> April which confirmed atrial fibrillation with a ventricular rate of 114 beats per minute. As her magnesium was a little low I have asked her to reduce her Omeprazole to 10mg daily. There is an association of too much acid suppression resulting in a reduction in magnesium absorption which itself can precipitate ectopic beats and possibly arrhythmias. She should continue the rest of her other medication which consists of Bisoprolol 5mg daily, Aspirin 75mg daily (until commenced on Warfarin), Amlodipine 5mg daily, iron sulphate, Mometasone nasal spray and Simvastatin 40mg daily. Her cholesterol level should be treated according to current primary prevention guidelines.

I will review her again in six months' time (4<sup>th</sup> November 2011).

Yours sincerely,

Thank you very much for referring this pleasant 44-year-old lady with a history of palpitations. She has had palpitations for over 10 years, but over the past year, her symptoms have worsened. Her palpitations can occur at any time, are fast, regular, and can last a few minutes. She can terminate her episodes by "bearing down" which is analogous to a Valsalva manoeuvre. She sometimes experiences a heavy pressing pain during her palpitation symptoms. Her symptoms are variable and can occur once a week or every few weeks. She is able to jog two times a week without any exertional symptoms although she has experienced her palpitations whilst jogging. She drinks up to two cups of coffee a day and up to 3 units of alcohol a week. There are no risk factors for ischemic heart disease however, she is unsure of her cholesterol level.

Her past medical history includes tonsillectomy, appendectomy, previous bilateral fractures of the wrists, arthroscopy of both knees, and an anterior cruciate ligament repair of the left knee. She had a normal mammogram in September 2014.

She is on no regular medication.

## Case 6

Her father is alive at age 72 and suffered with TB as a child. Her mother is alive at age 67 and has asthma and thyroid issues.

She is married with two children, ages 8 and 15. She works as an accountant.

Examination: pulse 58 beats per minute, regular. JVP not elevated. Blood pressure 130/80. Heart sounds S1 plus S2, plus a grade 2/6 systolic murmur in the aortic area and the left sternal edge. Her chest and abdomen were unremarkable. Her ECG showed normal sinus rhythm with a ventricular rate was 58 beats per minute. There was normal conduction indices and waveform morphology.

This lady's history of palpitations is suggestive of an organized arrhythmia and probably a supraventricular tachyarrhythmia. I have arranged for her to have a one week event recorder, an echocardiogram, as well as an exercise tolerance test. I have also arranged some baseline blood tests. I will review her afterwards with the results of these investigations.

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

Yours Sincerely,

### Diagnoses:

1. Palpitations – need to exclude a supraventricular tachyarrhythmia.
2. Appendicectomy
3. Bilateral wrist fractures.
4. Anterior cruciate ligament repair of the left knee.

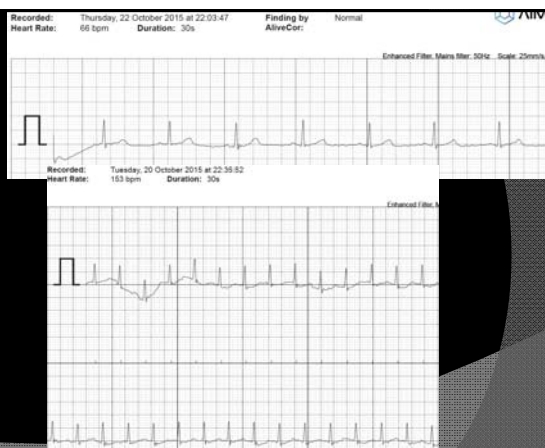
I reviewed [redacted] today in clinic following the recent investigations. Her haemoglobin, platelets, and white cell count were all normal. The MCV was mildly elevated at 102.9 fL (80-99). Her U&E's, calcium, glucose, and thyroid function tests were normal. Her total cholesterol is 3.1 mmol/L, HDL 1.6 mmol/L, triglycerides 0.5 mmol/L, LDL cholesterol 1.27 mmol/L. Her liver function tests were normal apart from a mildly elevated alkaline phosphatase of 142 IU/L (35-105).

Her echocardiogram showed a structurally normal heart. She underwent an exercise tolerance test where she exercised to 10 minutes, 40 seconds on the Bruce protocol, achieving a workload of 12.9 mets and 106% of her maximum predicted heart rate. The test was discontinued because of fatigue. She had an appropriate chronotropic and blood pressure response. There were no significant ECG changes and there were no arrhythmias. During her one week event recorder, she had no palpitation symptoms. However, there was one episode when she felt she had some chest pain and breathlessness, however, her ECG showed sinus rhythm with a ventricular rate of 97 beats per minute. There were short asymptomatic salvos of supraventricular ectopic beats up to four beats.

[redacted] remains well with no history of any palpitation symptoms since August. She has invested in an AliveCor ECG monitor, which she can use with her iPhone. If she has any further palpitation symptoms that are prolonged, she will make a recording and email it to me. I would appreciate if you can repeat her full blood count and liver function tests (monitoring her MCV and alkaline phosphatase, respectively), and arrange further investigations if required. I would like to review her in three months' time.

Case 6

Case 6



## Case 7

Thank you very much for referring this pleasant 71-year-old lady. On 6<sup>th</sup> May 2015, whilst playing badminton, she suddenly noticed that her heart was racing and did not settle. She felt lightheaded and felt that she could not breathe easily. There were no associated pre-syncope or syncope symptoms, chest pain or tightness. She described her palpitations as fast and irregular. She managed to drive home and her blood pressure machine recorded a systolic blood pressure of 100 mmHg and a pulse of 142 beats per minute. I believe there were some error messages initially trying to record her pulse rate (this is not unusual in the setting of atrial tachyarrhythmias). Her blood pressure is normally around 130/60. Her symptoms lasted for approximately 3 hours and gradually resolved. She has experienced no further subsequent symptoms or previous symptoms prior to this episode. She plays badminton twice a week and is quite active.

In 2011, after six immunization injections, prior to flying to South Africa, she woke the following morning with shortness of breath, and subsequently had a 24-hour tape and echocardiogram at the Hammersmith Hospital. These investigations, we believe

Case 7

were reported as normal. Her past medical history includes a partial oophorectomy for a non-malignant growth.

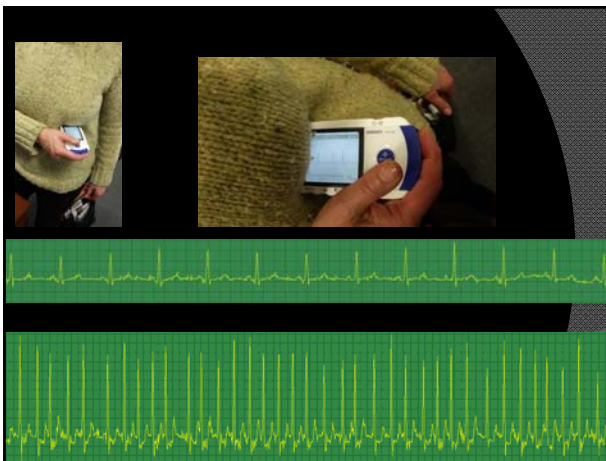
She takes aspirin 75 mg occasionally. Her mother died at age 67 years with a stroke. She is married with one daughter, age 52. She is an ex-smoker since 1999 and drinks up to 7 drinks of alcohol a week. There is no significant caffeine intake. She is a retired social worker.

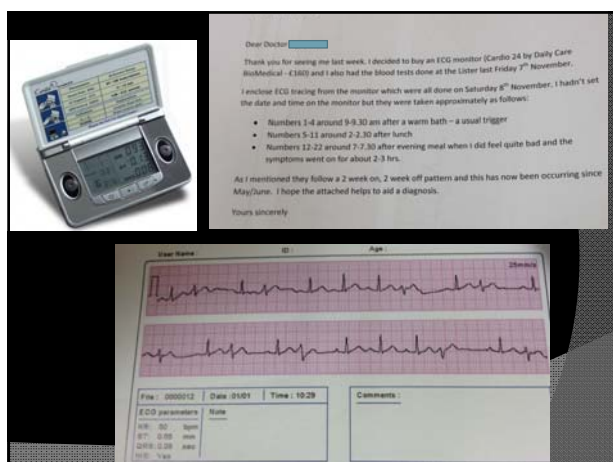
Examination: Pulse 62 beats a minute, regular. JVP is not elevated. Blood pressure 106/80. Heart sounds, S1 plus S2. Chest and abdomen were unremarkable. ECG shows normal sinus rhythm with normal conduction indices and wave form morphology.

I understand you have done some blood tests and I will appreciate if you can send me a copy of these results.

Her history is very suggestive of paroxysmal atrial fibrillation, which needs to be excluded. I have arranged for her to have an echocardiogram and exercise tolerance test given that her symptoms were precipitated during exertion. I was considering arranging a 24-hour tape; however, she is self-funding and the diagnostic yield, given that she has had no further symptoms is likely to be low. I have showed her an ECG monitor that she can use with her iPhone. Alternatively, she can purchase a separate device that can record a single lead ECG whenever she has symptoms. The costs of these devices are considerably less than the cost of arranging a 24-hour tape and would be more useful given that her symptoms occur sporadically. I will review her in due course.

Thank you very much for your referral. If you have any queries, please do not





## PALPITATIONS & ARRHYTHMIA MANAGEMENT

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