

INVESTIGATIONS IN CARDIOLOGY

INTRODUCTION

- Investigations serve to confirm a diagnosis and they do not replace clinical skills
- They must be interpreted within the clinical context
- They include:
 - CXR
 - ECG (resting and stress)
 - Echocardiogram
 - Cardiac catheterization
 - Coronary angiogram
 - Myocardial perfusion scans
 - MRI
 - CT scan
 - LAB tests
- Always treat the patient and not the result

CXR

- Cardiac silhouette gives important information on the size and state of the heart
 - Should occupy less than half of the hemi-thorax
 - Know the chambers forming the borders
 - LEFT BORDER - LV
 - RIGHT BORDER - RA
 - LEFT UPPER BORDER – LA/Pulmonary bay, aortic knuckle
 - Lung fields – help differentiate cardiac and respiratory causes of dyspnea e.g. pulmonary edema, pleural effusion
 - Ribs – e.g. notching in Coarctation of the Aorta due to new anastomoses being formed.
- Enlargement of the Left Atrium is called **spraying of the carina.**

FIND CXRs SHOWING:

- Dextro-cardia; situs inversus and a gastric bubble
- Cardiomegaly
- Dilated cardiomyopathy
- Consolidation
- Pericardial effusion

ECG

- Very important
- CONDUCTION SYSTEM:
 - SAN, atrial tissue, AVN, Hi Purkinje system, Lt/Rt bundles, ventricular tissue
- Aids in diagnosis of:
 - IHD especially Acute Coronary Syndromes (ACS)
 - The ECG is diagnostic.
 - ACS:
 - STEMI (Require thrombolysis within 6 hours max.)
 - Non-ST segment Elevation MI (Do not get thrombolysis)
 - Unstable Angina
 - Chamber enlargement
 - Arrhythmias
 - Electrolyte imbalance
 - Pericardial disease – effusion
 - PTE

ANALYZING ECG: KEY QUESTIONS

- What's the rhythm?
 - Are P waves present?
 - P waves represent atrial depolarization
 - How is the P wave related to the QRS complex?
 - P waves should always precede the QRS complex
 - Is every P wave followed by a QRS complex with a normal P-R interval?
- What's the R-R interval? – HR/ventricular response
 - 300 divide by the large squares = HR
 - 1500 divide by the small squares = HR
- What's the axis?
 - General direction of impulse flow
- Are ST segments normal?
- U waves are present in **hypokalemia** which can lead to cardiac arrest.

RULES DETERMINING A NORMAL ECG

- They all have a positive QRS EXCEPT **aVR** and **V1**
 - V1 is place at the right fourth interspace
 - aVR is place on the right arm
 - Therefore, for aVR and V1, the impulse is moving away
 - V1 has a positive QRS if the RV becomes bigger than the LV since, in that case, the former's activation (from left to right) camouflages the latter's (from right to left)
- R-R interval should always be regular
- A P-wave should always precede a QRS complex
- There should be a pattern
 - An irregular ECG is seen in AF.

FIND ECGs SHOWING:

- Sinus bradycardia
 - Seen in athletes and in deep sleep
- Sinus tachycardia
- Ventricular bigeminy
 - Ventricular ectopic beats

AXIS CALCULATION

- Lead II tends to move along the axis and is therefore used as the **rhythm strip**
- When finding the axis, use lead I and aVF.
- Demonstrate Right and Left Axis Deviation
- RAD is seen in Right Ventricular Hypertrophy
- LV strain – inverted T waves in V4, V6, aVL and LI

STRESS ECG

- Done when a diagnosis of CAD is suspected
- Follow up post-ACS to assess exercise tolerance and advice on life-style changes
- During myocardial perfusion scanning
- **Standard Bruce Protocol**
- Pharmacological stress testing
 - ? Adenosine
- Limitations; Left Bundle Branch Block (LBBB) – do perfusion scanning, Limb amputation, Clinical state of the patient etc.

ECHOCARDIOGRAM

- Visualizes the structure of the heart
- Definitive in diagnosis of structural abnormalities of the heart:
 - Valvular heart lesions
 - Atrial Septal Defect
 - Mitral stenosis
- A normal M – mode echo is used to estimate the contractility of the heart using the ejection fraction (EF) – normal is 55%
- Color Doppler can be done for mitral regurgitation

CARDIAC CATHETERIZATION

- Diagnosis of complex congenital heart disease when echo is inconclusive e.g. COA
Assess pulmonary pressures before correction of VSD and ASD
- Determine significance of shunting in ASD i.e. pulmonary/systemic flow ratio
- Diagnosis of restrictive cardiomyopathy vs. constrictive pericarditis
- Is therapeutic

CORONARY ANGIOGRAPHY

- Confirms and assesses the severity of CAD

LAB INVESTIGATIONS

- Cardiac enzymes – key in diagnosis of ACS
 - Troponin I/T
 - Creatinine phosphokinase – CK-MB
- Others
 - U/E/C
 - RBS
 - Lipid profile

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• **END**