Part 1 [1/2 page]

Disease: Coronary Heart Disease (CHD)

1. Describe briefly and concisely how the various types of Echocardiography (TTE, TEE, stress, Doppler) may be used for diagnosis of this diseases
2. Provide one example of an image of the echocardiography image of the heart that show normal and abnormal heart structure (e.g., leaky valve). The width of this image should not take up more than one-third of the width of the page. Do not use images provided in the notes.

Part 2 [1.5 pages]

For the following terms, with the help of relevant schematics, pictures, or diagrams, **explain in simple terms** (from scratch):

1. What they are and
2. How they are related to the condition/risk factor/progression/diagnosis/imaging/complications/treatment of the disease.

Your descriptions and explanations of these terms should have sufficient details and should be systematic and coherent:

Important notes

1. Do not exceed 2 pages (excluding cover page and references)
2. Abundance of details and sufficient explanations/elaborations in your own words. All medical terms that are included but are not introduced during the course must be clearly explained at a level that your classmates can understand.
3. Optimize the use of space in your report: wrap text around all figures and there should not be blank (unused) spaces in your report.
4. What is coronary heart disease?
5. What is Echocardiography?

A test that use sound waves to produce live images of the heart

1. Describe briefly and concisely how the various types of Echocardiography (TTE, TEE, stress, Doppler) may be used for diagnosis of this diseases
2. Provide one example of an image of the echocardiography image of the heart that show normal and abnormal heart structure (e.g., leaky valve). The width of this image should not take up more than one-third of the width of the page. Do not use images provided in the notes.

Types of Echocardiography

1. Transthoracic Echocardiography (TTE)

Non-invasive

On the ribcage

1. Transoesophageal Echocardiography (TEE)

Invasive

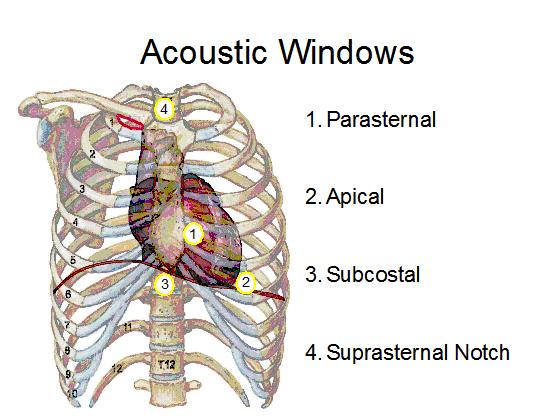
Better spatial resolution than TTE due to higher frequencies (bypass the lungs)

1. Stress echocardiography

Stress echocardiography is a test that uses ultrasound imaging to show how well your heart muscle is working to pump blood to your body. It is most often used to detect a decrease in blood flow to the heart from narrowing in the coronary arteries.

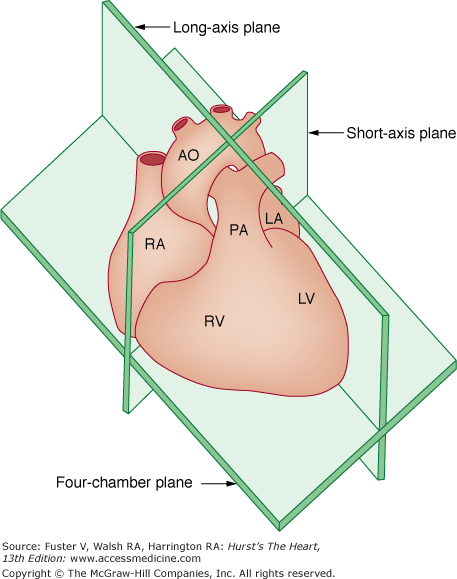
1. Doppler Sonography

* 2D Imagining: The parasternal windows: Long and Short Axis views

Long axis & Short Axis views

The parasternal window is essentially the 3rd of 4th gap in the ribcage from the top, it is directly at the position of the heart.

Diagram

Description automatically generatedAs shown above, long axis view simply means the plane that is parallel to the direction by which the width of the heart is long. Short axis view means the plane that is parallel to the direction by which the width of the heart is short.

Combining the terms together, “The parasternal windows: Long and Short Axis views” would mean the scanning plane given that the transducer is located at the parasternal window. Long axis is along the longer width of the heart and short axis is along the shorter width of the heart as visualised below.

In relation to coronary heart disease

TTE often has the transducer at the parasternal window for imaging of the heart.

* Aspirin therapy

Aspirin therapy is administering of aspirin to lowers the risk of heart attack and stroke.

Aspirin

* What is aspirin therapy?
* How aspirin treat coronary heart disease?
  + Reduce the clotting action of platelets
* What are the complications of aspirin therapy?

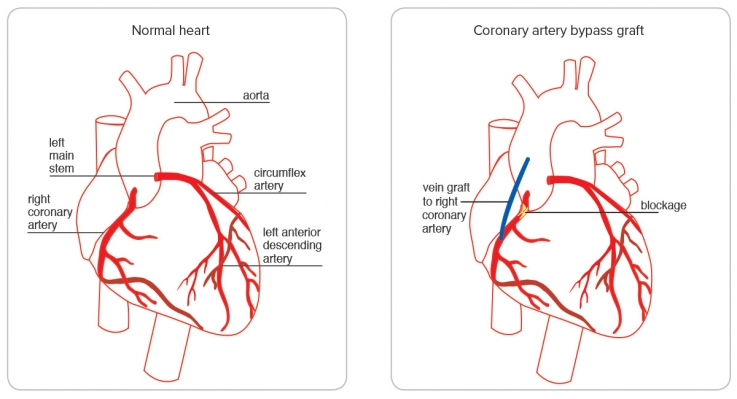
Aspirin is an anti-inflammatory drug. When an injury happens, Prostaglandins form at the area of injury and they are responsible for the formation of blood clots. Aspirin work by preventing Prostaglandins from forming thus reducing inflammation. Reduction of blood clot reduces the risk of thrombosis leading to a heart attack.

* Coronary artery bypass graft

Coronary artery bypass graft is a surgery to treat coronary heart disease.

* What is coronary artery bypass graft?
  + Where is the vein graft obtained from?
* How it treats coronary heart disease?
* What are the complications?
  + Is the treatment temporary fix?

<https://www.heartfoundation.org.nz/your-heart/heart-treatments/coronary-artery-bypass-graft-surgery>



Part 1 (a)

Transthoracic Echocardiography (TTE), Transoesophageal Echocardiography (TEE), Stress echocardiography and Doppler Sonography utilise the mechanism of ultrasound to image the heart.

For TTE, ultrasound transducer is placed in between the gaps of the ribcage to image the heart. For TEE, a TEE probe with an ultrasound transducer (like an endoscope) is inserted into the patient down the oesophagus and the heart is imaged. Both TTE and TEE can be used to see the movement of the heart structures live. By assessing the movement of the heart structures, the doctor can assess whether there are blockages in the arteries which is a indicator of coronary heart disease. Key differences are that TTE is non-invasive, but TEE is invasive. However, this allows TEE to have better spatial resolution compared to TTE as ultrasound emitted will not be absorbed by the lungs and TEE is much closer to the heart, allowing the use of higher frequencies.

For Stress echocardiography, the doctor will image the patient’s heart while at rest. Then the patient will exercise, and the doctor will monitor the heart rate and blood pressure. When the heart rate reaches a peak or a target value, the doctor will take image the heart. The doctor will then compare the images of the heart while it is at rest and under stress. Regions of the heart that seems weak during stress and not enough blood flow to the heart, are indicators of blockage and thus coronary heart disease.

For Doppler sonography, flow of the blood in the heart is imaged using ultrasound. Utilising the Doppler effect, this produces images that informs the doctor of the speed of blood flow in the heart and thus the rate of blood flow in the heart. The amount of blood pumped with each heartbeat is an indication of the size of a vessel's opening. If the blood flow is low, it is an indicator of blockage and thus coronary heart disease.

Part 1 (b)

<https://www.hkmj.org/abstracts/v26n1/44.htm>

A picture containing text

Description automatically generated<https://www.hkmj.org/system/files/hkmj198080-fig-2.jpg>

These figures are captured by transthoracic echocardiography, these shows long axis 4-chamber view of a 77-year-old patient with abnormal heart structure (top) and a 34-year-old healthy person. (bottom) One can observe that the top figure, the chambers are abnormally inflated.