Cert Cardiology(SA) Phys

THE COLLEGES OF MEDICINE OF SOUTH AFRICA

Incorporated Association not for gain
Reg No 1955/000003/08

Examination for the Subspecialty Certificate in Cardiology of the College of Physicians of South Africa

27 February 2020

Paper 1 (3 hours)

All questions are to be answered. Each question to be answered in a separate book (or books if more than one is required for the one answer)

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1 a) i) Describe the pathophysiology of ascites in severe right heart failure. (4)

ii) Define the clinical and laboratory characteristics of a transudate, exudate and chylous examples of ascitic fluid. (4)

b) i) Describe the contents and function of the extracellular matrix (ECM) of the heart. (4)

ii) Briefly discuss the pathophysiology of myocardial fibrosis and how this affects the ECM. (4)

iii) Discuss the mechanism of Late Gadolinium Enhancement (LGE) and various LGE patterns in Amyloid, Sarcoid and Fabry's disease involvement of the heart. (5)

c) i) Differentiate between drug pharmacokinetics and drug pharmacodynamics. (2)

ii) What phenomenon does the graph (Figure A) below indicate and explain your answer? (2)

iii) Which anti-anginal agent classically exhibits this phenomenon? (1)

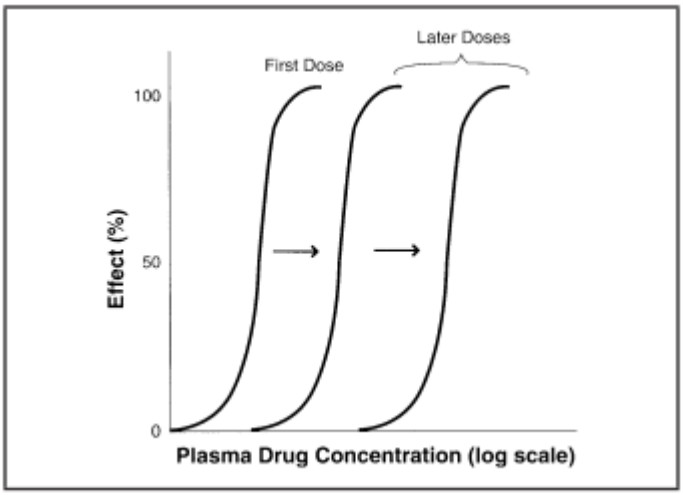

Figure A

iv) Using the same axes in Figure A indicate by drawing a new graph with 2 different curves how 2 drugs after the first dose of the same class will appear if they have different potencies (drug A more potent than drug B). (2)

PTO/Page 2 Question 1d)…

d) i) What does heparin bind to for its action on inactivating 2 clotting factors? Name these clotting factors that are inactivated. (3)
ii) What enzyme does warfarin inhibit in the liver as its' method of action and what is the role of this enzyme? Name the Vitamin K dependent clotting factors and anti-clotting factors. (4)

e) Your patient presents with dyspnoea with no significant valvular disease, and is found following right heart catheterisation to have the following readings

Haemoglobin 16.5 g/dl, Heart rate 110 beats / minute, Pa Oxygen Saturation of 52% , Ao Oxygen Saturation of 96%, Creatinine 130 umol/l, Potassium 5 mmol/l, INR 1.8 ,Pulse oximeter 94%, Blood pressure 98/72 mmHg, Mean RA pressure 25 mmHg, PA pressure 60/25 47 mmHg mean, Wedge pressure mean 45 mmHg, Cardiac output 3.34 l/min.

i) Where, on the respiratory cycle, is the optimal measurement point for measuring atrial and wedge pressures? (1)
ii) What portion of the right ventricular waveform reflects the preload state of the patient? (1)
iii) What is this patient's pulmonary vascular resistance, (wood units), based off the haemodynamics? (1)
iv) What is the patient's pulmonary vascular resistance, in metric units? (1)
v) What is the patient's stroke volume? (1)
vi) What is the most likely diagnosis for this patient, based on the haemodynamic assessment and give reasons for your answer? (5)

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2 a) Briefly discuss
i) Insulin Resistance and Coronary Artery Disease. (5)
ii) Nitric oxide with reference to its action on the myocardium. (5)

b) Briefly discuss the haemodynamic changes during pregnancy and the peri-partum period and how these may lead to the decompensation of patients with valvular heart disease. (10)

c) Briefly discuss ethanol induced arrhythmias with reference to
i) Types of arrhythmias.
ii) Probable mechanisms and associations.
iii) Role of stress-activated c-Jun N-terminal kinase (JNK) in the "Holiday Heart Syndrome". (10)

d) Briefly discuss:
i) The venous drainage of the heart with an illustrated diagram. (5)
ii) Right ventricular function in pressure and volume overload states. (5)
iii) The medical treatment of acute aortic dissection. (5)

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3 a Describe the anatomy of the tricuspid valve. (7)
b) Describe the various methods for assessment of aortic stiffness. (8)
c) Discuss the metabolic factors that regulate coronary vascular resistance. (10)
d) Describe pathophysiological mechanisms for cardiovascular diseases in patients with obstructive sleep apnoea syndrome (OSA). (10)
e) Discuss the ischaemic cascade and the use of various diagnostic modalities along its path. (10)
[45]

4 a) Answer the following questions related to the AORTIC Valve.
i) Draw an annotated diagram of the components of the aortic root complex. (5)
ii) Describe the embryological development of the aortic valve. (5)
iii) Describe the common clinical presentations and clinical bedside findings of severe aortic stenosis and provide a pathophysiological mechanism for them – feel free to use a table. (10)

b) Answer the following questions related to the Fontan Palliation.
i) Define and provide an illustration of the Fontan Circulation. (5)
ii) Describe the long-term complications of a Fontan palliation. (5)

c) i) Draw an annotated diagram of the haemodynamic tracing (Main pulmonary artery to RV) in a patient with an unrepaired tetralogy of Fallot. (5)
ii) Draw an annotated diagram showing the classic haemodynamic findings in a patient with hypertrophic obstructive cardiomyopathy (HOCM). (5)
iii) Describe your approach to risk stratification for sudden cardiac death in HOCM patients. (5)
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28 February 2020

Paper 2 (3 hours)

All questions are to be answered. Each question to be answered in a separate book (or books if more than one is required for the one answer)

For question 1a refer to the Current SA Dyslipidaemia Guidelines

A patient presents with the following blood results and clinical data. She asks for your opinion on whether she should go onto a statin or not.

Age 48, non-smoker
TC 6.25 mmol/l
HDL 1.25 mmol/l
Triglycerides 2 mmol/l
SBP on no treatment 144 mmHg
DBP on no treatment 90 mmHg

Estimate of 10-year risk of CVD for men

Age (yrs)	Points
30 - 34	0
35 - 39	2
40 - 44	5
45 - 49	6
50 - 54	8
55 - 59	10
60 - 64	11
65 - 69	12
70 - 74	14
75 years or older	15

Total cholesterol (mmol/l)	Points
<4.10	0
4.10 - 5.19	1
5.20 - 6.19	2
6.20 - 7.20	3
>7.20	4

HDL-cholesterol (mmol/l)	Points
≥1.50	-2
1.30 - 1.49	-1
1.20 - 1.29	0
0.90 - 1.19	1
<0.90	2

Systolic BP – untreated (mmHg)	Points
<120	-2
120 - 129	0
130 - 139	1
140 - 159	2
≥160	3

Systolic BP – on antihypertensive treatment (mmHg)	Points
<120	0
120 - 129	2
130 - 139	3
140 - 159	4
≥160	5

Smoker	Points
No	0
Yes	4

Estimate of 10-year risk of CVD for women

Age (yrs)	Points
30 - 34	0
35 - 39	2
40 - 44	4
45 - 49	5
50 - 54	7
55 - 59	8
60 - 64	9
65 - 69	10
70 - 74	11
75 years or older	12

Total cholesterol (mmol/l)	Points
<4.10	0
4.10 - 5.19	1
5.20 - 6.19	3
6.20 - 7.20	4
>7.20	5

HDL-cholesterol (mmol/l)	Points
≥1.50	-2
1.30 - 1.49	-1
1.20 - 1.29	0
0.90 - 1.19	1
<0.90	2

Systolic BP – untreated (mmHg)	Points
<120	-3
120 - 129	0
130 - 139	1
140 - 149	2
150 - 159	4
≥160	5

Systolic BP – on antihypertensive treatment (mmHg)	Points
<120	-1
120 - 129	2
130 - 139	3
140 - 149	5
150 - 159	6
≥160	7

Smoker	Points
No	0
Yes	3

Points total for men

Points total	10-year risk (%)
-3 or less	<1
-2	1.1
-1	1.4
0	1.6
1	1.9
2	2.3
3	2.8
4	3.3
5	3.9
6	4.7
7	5.6
8	6.7
9	7.9
10	9.4
11	11.2
12	13.2
13	15.6
14	18.4
15	21.6
16	25.3
17	29.4
18 or more	>30

Points total for women

Points total	10-year risk (%)
-2 or less	<1%
-1	1.0
0	1.1
1	1.5
2	1.8
3	2.1
4	2.5
5	2.9
6	3.4
7	3.9
8	4.6
9	5.4
10	6.3
11	7.4
12	8.6
13	10.0
14	11.6
15	13.5
16	15.6
17	18.1
18	20.9
19	24.0
20	27.5
20 or more	>30

PTO/Page 3 Question 1…

1 a) From the table provided, calculate and state her 10-year cardiovascular (CV) risk.

i) What is the name given to this CV risk table and what CV events are included in this 10-year CV risk assessment? (2)

ii) List separately, the types of patients considered to be at **very high** or **high risk** of CV events and who **DO NOT** require using this risk scoring table. (5)

iii) Do you think you require more information on this patient prior to deciding on statins? If you think not, then answer "No" on your examination paper with your reasoning but continue to answer the subsequent questions. If you feel more information is required, please list the additional question/s you would ask her. (1)

iv) You remain undecided and request further investigation/s. Which further radiological/imaging investigation/s could help you further risk stratify your patient? Explain why a negative result for your chosen investigation/s will help you decide. (4)

v) One further possible issue prior to deciding, is that the patient is very concerned about the reported side effects of statins that she reads on-line. Please list the important side effects and their relative frequency that are recognised in the medical literature and which you would convey to her. List in addition the benefits of lipid lowering – i.e. for 1 mmol/l reduction in LDL quote the approximate % reductions in the individual components of the 3 point major adverse cardiac events (MACE) separately and for revascularisation procedures. (4)

b) A pregnant woman (28-weeks), presents stable to casualty with acute onset of a rapid, narrow complex supra-ventricular tachycardia at 150 beats / minute and a diagnosis of AV nodal re-entry tachycardia is made. Describe your management of the patient with regards to

i) Conservative measures. (2)

ii) Use of intravenous medication/s to convert her to sinus rhythm. (2)

iii) Considering underlying causes for the AVNRT. (2)

Subsequently she is found to have persistent LV systolic dysfunction (EF 32%) and describes NYHA functional class II symptomatology.

i) List the medications indicated for HFrEF **and** which you can use in this patient considering safety in pregnancy. In addition, discuss the HFrEF medications contraindicated in pregnancy and their associated foetal malformations. (5)

ii) A further blood test performed revealed that her plasma LDL was 5.4 mmol/l. Discuss the changes in lipoproteins during pregnancy and if you would recommend statin therapy during the pregnancy, with substantiation of your answer. (6)

c) In the Eisenmenger Syndrome related to a large ASD associated with severe pulmonary hypertension

i) Should the underlying defect be closed? (1)

ii) Is infective endocarditis prophylaxis required for appropriate procedures? (1)

iii) The patient's HB is 18.6 g/dl and serum ferritin is < 16 mg/L, transferrin saturation 16 % - describe your approach to management. (2)

iv) The same patient's haematocrit is 60%. She describes lethargy and occasional headaches. Discuss your approach to venesection. (2)

v) What immunisations would you recommend? (2)

vi) What medication/s could be used to manage the pulmonary hypertension and why would you give it/them? (4)

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2 a) A 56-year-old male patient presents with an acute anterior ST elevation myocardial infarction and cardiogenic shock. He undergoes a diagnostic coronary angiogram which reveals proximal left anterior descending artery occlusion. Soon thereafter he developed atrioventricular disassociation for which the right ventricle was paced by a temporary pacing wire. Access for the coronary angiogram and pacing wire were via the right femoral artery and vein respectively. He then underwent percutaneous coronary intervention and stent implantation to the proximal left anterior descending artery. There was immediate improvement in the clinical parameters and resolution of the atrioventricular dissociation. Six hours post procedure the temporary pacing wire and the sheaths are removed. Soon thereafter, the patient becomes hypotensive. Briefly discuss your differential diagnosis for the decline in the patient's condition and outline the investigations you would perform and how each investigation will help in determining the diagnosis. (10)

b) Briefly discuss Cardiac Sarcoidosis with reference to
   i) Clinical Features.
   ii) Diagnosis.
   iii) Treatment . (15)

c) Regarding the clinical utility of iFR / FFR. Briefly discuss the
   i) Indications and rationale for their use in interventional cardiology. (4)
   ii) Physiological principles underlying the two technologies. In your answer differentiate between the two technologies where appropriate. (4)
   iii) Name **One (for each modality)** key landmark trial/s that justified the utility of this technology. (2)

d) Briefly discuss Takatsubo Cardiomyopathy with reference to
   i) Definition.
   ii) Clinical Presentation.
   iii) Treatment. (10)

[45]

3 a) Discuss the medical management of a 30-year-old female, who presents with acute anterior MI in the setting of cocaine overdose. (8)

b) Define contrast-induced nephropathy and discuss how it can be prevented. (10)

c) Discuss the haemodynamic impact of constrictive pericarditis on
   i) The right atrium. (5)
   ii) The right and left ventricles. (14)

d) What are important considerations when contemplating transcatheter aortic valve implantation (TAVI) in a younger patient with severe aortic stenosis? (8)

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4 a) A 26-year-old patient is incidentally found to have mitral incompetence. He denies any cardiac symptoms and is now referred to you for evaluation. Describe your approach to the management of this patient under the following headings
   i) The role of cardiac imaging in making your assessment. (7)
   ii) The indications for surgery as per current clinical management guidelines. (7)

b) Describe the principles of medical management and complications of cyanotic congenital heart diseases. (10)

PTO/Page 5 Question 4c)…

c) Describe the common side effects and concerns regarding initiation of the following drugs.
   i) Sildenafil. (3)
   ii) Bosentan. (3)

d) You have recently started a cardiac - obstetric clinic. The following patients are presenting to you indicating their desire to fall pregnant. They are all asymptomatic. Assuming you are counselling the patient, taking into account the physiological changes that occur with pregnancy.

   For each condition listed below, risk stratify the patient as per the WHO classification and provide a counselling and medical management strategy for the anticipated complications pertaining to each lesion
   i) Asymptomatic patient with mitral stenosis (mean gradient of 7 mmHg and valve area of 1.4cm^2). (5)
   ii) Asymptomatic severe aortic incompetence (LVIDd 58mm, LVEF 65%). (5)
   iii) Severe pulmonary hypertension (RVSP on echo 68mmHg, RAP 10mmHg, and BP 90/62 mmHg). (5)

[45]