Diagnosis and Management of Ischaemic Heart Disease

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This article has been selected by the Editorial Board of the Hong Kong Medical Diary for participants in the CME programme of the Medical Council of Hong Kong (MCHK) to complete the following self-assessment questions in order to be awarded one CME credit under the programme upon returning the completed answer sheet to the Federation Secretariat on or before 31 December 2004.

Ischaemic heart disease (IHD) is the leading cause of death in the developed countries. In Hong Kong there are about 5,000 people died of heart disease every year. The number of young patients suffering from ischaemic heart disease is increasing.

Diagnosis of ischaemic heart disease requires careful history taking and physical examination, along with directed investigations. Many patients with ischaemic heart disease have angina pectoris, but they may be asymptomatic. A clinical diagnosis of typical angina has a 90 percent predictive accuracy for the presence of coronary atherosclerosis.

Angina pectoris is classified as stable when its characteristics (frequency, severity, duration, time of appearance, and precipitating factors) have not changed for the previous 60 days. It may be precipitated by physical activity, emotions, eating or cold weather. It is often located substernally but may also occur in (or radiate to) the neck, jaw, back, shoulder, or arm, more commonly on the left side. The Canadian Cardiovascular Society (CCS) Functional Classification of angina pectoris can be used to assess the severity of symptom.

| Canadian Cardiovascular Society Functional Classification of Angina Pectoris |
|---------------------------------|---------------------------------|
| Class I                         | Ordin ary physical activity, such as walking and climbing stairs, does not cause angina. Angina results from strenuous or rapid or prolonged exertion at work or recreation. |
| Class II                        | Slight limitation of ordinary activity. Walking or climbing stairs rapidly, walking uphill, walking or stair climbing after meals, in cold, in wind, or when under emotional stress, or only during the few hours after awakening. Walking more than two blocks on the level and climbing more than one flight of ordinary stairs at a normal pace and under normal conditions. |
| Class III                       | Marked limitations of ordinary physical activity. Walking one to two blocks on the level and climbing more than one flight under normal conditions. |
| Class IV                        | Inability to carry on any physical activity without discomfort anginal syndrome may be present at rest. |

Physical examination should include checking the signs of hyperlipidaemia - xanthoma and xanthelasma, tobacco staining of fingers, signs of peripheral vascular disease - unequal pulses and carotid bruit, and signs of congestive heart failure.

Certain tests may help determine the severity of ischaemia and the presence and extent of the coronary artery disease. Exercise stress electrocardiography is the most widely applied test to obtain objective evidence of myocardial ischaemia and significant coronary artery disease (CAD) and to obtain prognostic data regarding ventricular performance in patients with known CAD. Bayes' theorem states that the pretest disease prevalence influences the posttest likelihood of significant CAD. Hence it is of the greatest diagnostic value in the evaluation of middle-aged men with atypical angina and a pretest probability of significant disease of 30 to 70%. The mortality rate of this test is 1 in 10,000.

Radionuclide cardiac imaging provides higher sensitivity and specificity for diagnosis of IHD than exercise ECG testing. It has some poor prognostic factors such as increased lung thallium 201 uptake, extensive perfusion defects and post-exercise transient left ventricular dilatation.

Echocardiography provides a good estimate of ventricular size and regional and generalised left ventricular wall motion. Stress echocardiography either by exercise or by pharmacological means is comparable in accuracy to radionuclide testing for the diagnosis of CAD.

With recent advancement in technology, some new cardiac investigations have become widely available as diagnostic techniques for ischaemic heart disease. Positron emission tomography (PET) provides more accurate result for detection of CAD and it also provides an estimate of coronary blood flow and coronary flow reserve as well as myocardial viability. But the high cost of equipment limits its popularity.

Magnetic resonance imaging (MRI) and computed tomography (CT) are two rapidly advancing fields. Modern technology allows rapid acquisition of images of high definition, together with gating technique enables detailed scanning of the heart which is a continuously beating organ. Magnetic resonance angiography enables visualisation of the
large coronary arteries. Together with perfusion studies, it enables identification of ischaemic or infarcted myocardium. CT angiography can provide high resolution imaging of the heart and give good visualisation of the coronary arteries.

Although these new techniques provide safe and accurate visualisation of the large coronary arteries, coronary angiography is still the gold standard in the diagnosis of ischaemic heart disease. It ascertains the anatomic extent and severity of atherosclerotic involvement of the coronary arteries. The mortality rate of such invasive test is 1 in 1,000.

The major targets for treating ischaemic heart disease are to improve the quality of life by relieving symptoms and to increase the quantity of life by improving prognosis. The modifiable risk factors of patients should be assessed and intervened in order to reduce the incidence of CAD events. These modifiable risk factors are cigarette smoking, LDL-cholesterol level, systemic hypertension, left ventricular hypertrophy, thrombogenic factors and diabetes mellitus. Other factors for which interventions may reduce the incidence of CAD events are psychosocial factors, triglycerides, lipoprotein (a), homocysteine, oxidative stress and consumption of alcohol.

Pharmacotherapy for IHD includes aspirin, nitrates, beta-adrenergic blocking agents, calcium-channel blockers and statins. In Physicians’ Health Study involving 333 male physicians with angina pectoris, low dose aspirin decreased the incidence of a first myocardial infarction by 87%. There were also numerous large clinical trials showing the benefit of low dose aspirin in the context of secondary prevention of acute myocardial infarction. Nitrates could be taken prophylactically before exertion or event known to precipitate angina pectoris. The development of tolerance is a major disadvantage of chronic nitrate therapy and a nitrate free period of 10-12 hours should be allowed. Beta blockers can decrease episodes of both symptomatic and asymptomatic myocardial ischaemia. They are usually administered in dosages to lower the resting heart rate to 50-60 beats per minute. Calcium channel blockers are useful in relieving symptoms and in Prinzmetal angina. Short acting dihydropyridine group of calcium channel blocker should be avoided in patients with CAD. Numerous well conducted primary and secondary prevention trials have confirmed the benefit of LDL-cholesterol lowering by statins in patients with CAD.

Other than medical therapy, revascularisation procedures for IHD include percutaneous coronary intervention procedures and open heart surgery. Invasive revascularisation procedures will be considered in patients with chronic stable angina who are refractory to medical management or who are at high risk of cardiac events. There are many kinds of percutaneous coronary interventional revascularisation procedures. Percutaneous transluminal coronary angioplasty and intra-coronary stenting are commonly used in most clinical practice. Other percutaneous coronary interventional procedures like rotablator, directional coronary atherectomy (DCA), percutaneous transluminal coronary laser angioplasty (PTCLA), clot extraction (endarterectomy) and intracoronary brachytherapy may be used in special situations.

Recently, drug-eluting stents (DES) have been shown to reduce the restenosis rate from an average of 30% for bare metal stents (BMS) to around 9%. It can successfully deal with all the three basic mechanisms of restenosis, namely, recoil, negative remodelling and neo-intimal hyperplasia. A DES comprises of 3 components: stent, polymer layer and drug. The stent is the same as the conventional BMS which provides a scaffolding effect. The polymer layer is a diffusion barrier that regulates the release of drugs in a controlled manner. The drug that is impregnated in the polymer layer inhibits the complex cascade of events that leads to neointimal formation after stent implantation. First introduced into Hong Kong in 2002, drug eluting stents have rapidly become the treatment of choice in replacing BMS in percutaneous coronary intervention (PCI) locally and worldwide. Currently it accounts for about 60% of the coronary stents sold in the United States each month. 

Cypher stent using sirolimus (Johnson and Johnson Company Cordis Corporation, Mian Lakes, FL, USA) and Taxus stent using paclitaxel (Boston Scientific Corporation, Natick, MA, USA) are the 2 DES currently available. The short and mid term safety and efficacy of DES have been ascertained by well conducted clinical trials.

Looking into the future, bioabsorbable stents, angiogenesis, gene therapy, further refinement of minimal invasive and robotic coronary bypass surgery may turn out to be useful armaments in combating ischaemic heart disease.

MCHK CME Programme Self-assessment Questions

Please read the article entitled “Diagnosis and Management of Ischemic Heart Disease” by Dr. Chiang Chung-seung and complete the following self-assessment questions. Participants in the MCHK CME Programme will be awarded 1 CME credit under the Programme for returning completed answer sheet via fax (2865 0345) or by mail to the Federation Secretariat on or before 31 December 2004. Answers to questions will be provided in the next issue of The Hong Kong Medical Diary.

Questions 1-5: Please select one best answer. Questions 6-10: Please answer T(True) or F(False).

1. Which of the following criteria indicate(s) a diagnosis of unstable angina pectoris?
   a) New onset angina (2 months) that is either severe or frequent (three episodes daily) or both
   b) Patients with accelerating angina
   c) Patients with angina at rest
   d) B and C
   e) All of the above
2. The following medications are useful in treatment of ischaemic heart disease except:
   a) Aspirin
   b) Heparin
   c) Beta-blocker
   d) Nitrates
   e) Short acting dihydropyridine calcium channel blocker

3. Which of the following tests is least specific for diagnosis of ischaemic heart disease?
   a) Stress echocardiogram
   b) Thallium myocardial scan
   c) PET scan
   d) Treadmill exercise test
   e) Coronary angiogram

4. Which of the following percutaneous coronary intervention instrument is most commonly used in clinical practice at present?
   a) Intra-coronary stent
   b) Rotablator
   c) Directional coronary atherectomy catheter
   d) Endarterectomy device
   e) Intracoronary brachytherapy device

5. Which of the following statements concerning drug eluting stent (DES) is true?
   a) DES has the same restenosis rate as bare metal stent
   b) Currently there are 4 kinds of DES commercially available in Hong Kong
   c) DES comprises of 3 components: stent, polymer layer and drug
   d) The drug of the DES is effective in counteracting negative remodelling
   e) DES at present accounts for 30% the intracoronary stents implanted in the USA

6. The Canadian Cardiovascular Society Functional Classification is used to assess the severity of heart failure.

7. Angina pectoris is a mandatory symptom for patients with ischaemic heart disease.

8. Magnetic resonance imaging (MRI) and computed tomography (CT) are two rapidly advancing fields in cardiac imaging.

9. It is undesirable to use nitrate therapy continuously for 24 hours for patients with ischaemic heart disease.

10. Calcium channel blocker is an effective treatment of Prinzmetal angina.

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**ANSWER SHEET FOR DECEMBER 2004**

Please return the completed answer sheet to the Federation Secretariat on or before 31 December 2004 for documentation. 1 CME point will be awarded for answering the MCHK CME programme (for non-specialists) self-assessment questions.

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**Answers to November 2004 issue**

Respiratory Viral Infections in Hong Kong Children - What is New?

1 e 2 e 3 b 4 a 5 d
6 T 7 F 8 T 9 T 10 F