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CARDIO VASCULAR SURGERY

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KAROLINUM

CARDIOVASCULAR SURGERY

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VASCULAR SURGERY (*Milan Krajíček, Pavel Šebesta*)

GENERAL INTRODUCTION

During the past fifty years, cardiovascular surgery has become one of the pillars of surgery in general. The search for a more effective treatment of an increasing number of cardiovascular diseases contributed to the relatively rapid development of surgical tactics and techniques, instruments, vascular substitutes and other necessary tools. Its very important role has also been played in the progress of diagnostic procedures, anesthesiology, prevention of infection and other specialties. The substance of cardiovascular surgery was deeply affected during the past twenty years by the development of intraluminal procedures performed mostly by radiologists. However, these two approaches are not antagonistic, but symbiotic.

The trend of the recent past is to direct education to the qualification of the vascular interventionist who will be able to perform surgical as well as intraluminal procedures.

Cardiovascular surgery is an important part of the state examination in surgery.

In Czech universities, a substantial number of foreign students study medicine for which the courses are presented in the English language. However, as far as cardiovascular surgery is concerned, so far, no texts in this language have been available for study. This work deals with all aspects of said field to acquire the necessary level of knowledge for the successful coping with the demand of the state examination in surgery. The concept of this text tries not only to furnish the necessary facts, but also offers an understanding of different facts from the physiological, pathophysiological and anatomical point of view.

The authors wish students to use the text to their benefit, and also wish them good luck.

Last, but not least, the authors warmly thank their friends and backers, who by this or other way, mostly as language consultants, did contribute to the quality of this work.

Milan Krajíček

CARDIAC SURGERY

1 THE FUNDAMENTALS OF CARDIAC SURGERY

1.1 PREOPERATIVE ASSESSMENT

The initial diagnosis of heart disease is usually determined by the cardiologist, and is made by reviewing the medical history, a physical examination and different diagnostic techniques to confirm the diagnosis. This is presented on referral to cardiac surgeons, and further assessment can be proposed about the extent to which cardiac surgery may relieve symptoms. On admission to hospital, the medical history and some degree of physical examination occur in an attempt to gain a baseline on the physical condition of the patient and to determine whether the patient's illness has deteriorated.

1.1.1 Patient History

Dyspnea

This is an abnormal sensation of breathlessness on effort or at rest. With increasing disability, orthopnea and paroxysmal nocturnal dyspnea (PND) occur. A dry nocturnal cough is often a sign of impending PND. In acute pulmonary edema, pink frothy sputum and streaky hemoptysis occur. With poor left ventricular function, Cheyne-Stokes ventilation makes the patient feel dyspneic in the fast cycle phase. Effort tolerance is graded by the New York Heart Association criteria (Table 1).

Table 1. New York Heart Association classification of dyspnea

Class	Classification
1.	Patients with cardiac disease, but without resulting limitations of physical activity. Ordinary physical activity does not cause breathlessness.
2.	Patients with cardiac disease resulting in slight limitation of physical activity. They are comfortable at rest. Ordinary physical activity results in dyspnea (e.g., walking up two flights of stairs, carrying a shopping basket, making beds). By limiting physical activity, patients can still lead a normal social life.

3.	Patients with cardiac disease resulting in marked limitation of physical activity. They are comfortable at rest, but even mild physical activity causes dyspnea (e.g., walking around the flat). The patient cannot do any shopping or housework.
4.	Patients with cardiac disease who are unable to do any physical activity without symptoms. Dyspnea may be present at rest. They are virtually confined to a bed or chair and are totally incapacitated.

Palpitations

This is the undue awareness of heart action. The heart rate may be normal or increased, and the rhythm regular or irregular. The sensations may be described as a heavy or pounding heartbeat, a fluttering in the chest, a racing heart (regular or irregular), a missed beat; and the heart turning over. The history of palpitations may range from a few hours to decades; palpitations may occur daily or very infrequently, with intervals of months or even years. In most patients, palpitations are not associated with primary heart disease. The patient is aware of a normal heart beat or of simple sinus tachycardia associated with anxiety or extracardiac disease (e.g., infection or thyrotoxicosis).

History of Angina

The degree to which angina is suffered and its effect on the patient as an individual may give an indication of the severity of the disease. The Canadian Cardiovascular Society produced a classification of angina, which is widely used as a measure (Table 2).

Table 2. Canadian classification of angina

Grade	Characteristics
I.	Ordinary exercise does not cause angina (strenuous activity provokes angina)
II.	Slight limitation of ordinary physical activity (climbing more than one flight of stairs and walking uphill)
III.	Marked limitation of ordinary physical activity (walking on the level or climbing one flight of stairs provokes angina)
IV.	Inability to carry on any physical activity/angina may be present at rest

Syncope

This is the brief loss of consciousness as a result of inadequate blood supply to the brain. The immediate cause is reduced cerebral artery perfusion pressure, which may be the consequence of a fall in cardiac output, peripheral vascular resistance or both. Syncope can occur for a variety of reasons as highlighted in Table 3.

Table 3. Causes of syncope

Cause	Contributing factors
Inappropriate vasodilatation	Simple vasovagal faint
	Malignant vasovagal syndrome
	Hypersensitive carotid sinus syndrome
	Micturition syncope
	Orthostatic hypotension (diabetes / Parkinson's disease, age)
	Hypotensive drugs
Impaired cardiac function	Extreme bradycardia (heart block, sinoatrial disorder)
	Paroxysmal tachycardia
	Myocardial ischemia
Obstruction to ventricular emptying	Aortic stenosis
	Hypertrophic obstructive cardiomyopathy
	Pulmonary stenosis
	Pulmonary hypertension
Reduced ventricular filling	Cough syncope
Micturition syncope	Atrial myxoma
	Ball-valve thrombus of atrium
	Pulmonary embolism
Hypovolemia	Excessive diuretic therapy
	Hemorrhage

Physical examination between attacks may reveal evidence of significant valvular heart disease or cardiac arrhythmia, which gives a clue to the mechanism of syncope. The lying and standing blood pressure should be checked as a matter of course, but the absence of a falling blood pressure upon standing does not rule out the presence of orthostatic hypotension.

Cyanosis

Central cyanosis should be detectable when arterial saturation is less than 85% and when there is more than 5g of reduced hemoglobin present. It is more difficult to detect if the patient is anemic. Cardiac cyanosis is the result of an inadequate uptake of oxygen in the lungs secondary to pulmonary disease, or of right-to-left shunting, which results in deoxygenated blood bypassing the lungs and passing directly into systemic circulation. It is characterized by cyanosis, which affects the mouth and tongue as well as the extremities – these are warm to the touch. Peripheral cyanosis in the absence of central cyanosis may be caused by peripheral vasoconstriction and stagnation of the blood in the capillaries. It is best seen in the extremities and the lips, and is often associated with coldness of the part. It may occur in heart failure or be the result of local causes.

Embolism

Both systemic and pulmonary embolisms are common in cardiac disease. The following are some of the common factors: atrial fibrillation, aortic stenosis, mitral stenosis, infective endocarditis, and left atrial myxoma.

Edema

Factors important in cardiac disease are elevated venous pressure (congestive cardiac failure, pericardial constriction), increased extracellular volume (salt and water retention), secondary hyperaldosteronism, hypoalbuminemia (liver congestion, anorexia and poor diet), venous disease and secondary renal failure. Acute edema and ascites may develop in pericardial constriction. Protein-losing enteropathy can occur with a prolonged high venous pressure exacerbating edema. Patients presenting with pulmonary edema in the preoperative period could be commenced on a short course of diuretics, but the identification of pulmonary edema immediately preoperatively does not exclude the patient from surgery.

1.1.2 Physical Examination

The physical examination should start with the hands, because they can indicate the extent of the disease as well as the type of disease. Coldness of the extremities is the result of vasoconstriction or obstruction of the superficial blood vessels, so that the blood supply to the skin is reduced. In heart disease, it is often caused by peripheral vasoconstriction that follows a fall in cardiac output. In conditions with a high cardiac output, the peripheral vessels are dilated and the skin is very warm.

Facial and General Appearance

- Down's syndrome: an atrioventricular canal defect
- Elf-like faces: supravalvular aortic stenosis
- Turner's syndrome: coarctation, aortic stenosis
- Moon-like plump faces: pulmonary stenosis
- Noonan's syndrome: pulmonary stenosis, peripheral pulmonary artery stenosis
- Mitral facies with pulmonary hypertension
- Central cyanosis
- Differential cyanosis in patent ductus arteriosus (PDA) with pulmonary hypertension or interrupted aortic arch
- Xanthelasma

Teeth must be checked as part of the general cardiovascular examination. The condition of the mouth and teeth is particularly important in patients prone to bacterial endocarditis and under review for valvular surgery. In most cases, valve surgery will not occur until the patient has undergone a full dental screening for tooth decay. In many cases, this results in patients having a dental extraction before surgery. It is also important to note the presence of dentures, caps and crowns. Although this has no impact on surgery, it is important for anesthesia and placement of the endotracheal tube.