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The coronary angiography – An old-timer in great shape



Viktor Kočka *

Cardiocenter, Third Medical Faculty, Charles University in Prague, Ruská 87, Prague 10, 100 00, Czech Republic

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ABSTRACT

The invasive coronary angiography is the gold standard in coronary artery disease evaluation. It is one of the most common operative procedures worldwide. This topic covered in detail would be extensive and the author provides his own, personal view of the indications, technique and complications of this diagnostic test. The advantages and disadvantages are provided together with the opinion about the current role of invasive coronary angiography in modern cardiology.

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* Tel.: +420 267162701.

E-mail address: viktor.kocka@fnkv.cz<http://dx.doi.org/10.1016/j.crvasa.2015.09.007>

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Introduction

Selective coronary angiography was pioneered by Sones in 1958 [1]. The ease of selective coronary artery engagement was significantly improved with the development of specifically preformed catheters by Judkins [2] and Amplatz [3] few years later. The invasive coronary angiography (ICA) has since then revolutionized our understanding of pathophysiology and management of heart disease. This procedure is one of the most common operative procedures worldwide; approx. 50,000 patients undergo the ICA in the Czech Republic every year (unofficial data). There is a chapter devoted to the ICA in most of cardiology textbooks (for example the Czech language *Kardiologie* edited by Aschermann; the English language *The PCR-EAPCI Textbook* etc.) and an excellent historical review has been published by Ryan [4]. In fact, the book “*Koronarografie*” authored by Vančura and Aschermann and published by Avicenum in 1971 was one of the first books on this subject. I will therefore not attempt to provide a detailed comprehensive review of this topic but rather a personal, i.e. necessarily subjective opinion about the role of the ICA in the current cardiology arena.

Indications

The ICA is indicated whenever the information regarding the presence and/or the severity of coronary artery disease is required to improve patient symptoms or prognosis. There are detailed ESC guidelines on the management of: stable coronary artery disease [5]; acute coronary syndromes without ST-segment elevation [6] and acute myocardial infarction with ST-segment elevation [7]. The general idea appears to be simple: the higher the clinical risk and the more severe symptoms are present, the stronger the indication for the ICA. I would like to present my view on few potentially problematic clinical issues:

- (1) Coronary artery disease and the ICA should be considered in angina-free patients with recently diagnosed heart failure, reduced left ventricle systolic function or arrhythmia, especially of ventricular origin.
- (2) Patients presenting with persistent symptoms suggestive of acute myocardial infarction but no ST-segment elevation detectable on repeated electrocardiogram should be considered for ICA to exclude acute coronary artery occlusion, most often in left circumflex territory.
- (3) There are patients with unclear/atypical symptoms and/or equivocal results of non-invasive testing. The ICA will provide a definitive answer; even the normal finding can reassure the patient and therefore significantly improve the quality of life.
- (4) Patients with low clinical risk and mild non-limiting symptoms should not undergo the ICA without having non-invasive evaluation of myocardial ischaemia first. Any complication of the ICA in this setting might be difficult to justify.

There are no absolute contraindications for the ICA in the urgent setting. Elective ICA should be postponed until the patient cardiac and non-cardiac condition is stable.

Technique

The pre-procedure phase is important. Written informed consent should obviously be obtained; ideally by the medical staff who is educated and experienced at coronary angiography. Routine pre-operative tests are reviewed (biochemistry including renal function, full blood count, coagulation, ECG, echocardiography and other non-invasive testing), anti-allergic premedication and pre-hydration for renal protection should be considered. The optimal management of patients on chronic oral anticoagulation therapy remains unclear [8]. Should we interrupt the anticoagulation and risk the thrombosis; or should we perform the ICA (sometimes even followed by ad hoc stenting with a dual antiplatelet therapy) without stopping the anticoagulation and risk the bleeding complication? The advent of the new oral anticoagulants with a short half-life might help in the future. Certainly the approach to this issue must be tailored to the individual patient profile in the absence of clear scientific data.

The procedure itself is carried out in the catheterization laboratory [9] in local anaesthesia and typically takes less than 10–15 min. A conscious sedation is optional; we perform the majority of procedures without it (sedation in the elderly population is not risk free) but have low threshold to sedate any anxious or uncomfortable patient. The arterial access is gained by standard Seldinger technique. The vascular sheath is inserted and over the wire technique is used to cannulate both coronary ostia. Very gentle manipulation is crucial, should any resistance be felt the operator should proceed under X-ray visualization only. There is a clear trend to use the small diameter catheters, most operators use 5Fr (i.e. 1.7 mm) equipment. The use of pre-warmed contrast agents reduces their viscosity and improves the filling of coronary arteries. Multiple views of both coronary arteries are required for complete visualization of branched and often tortuous coronary tree. Radiation time and dose are recorded for every patient [10,11]. This enables the independent audit of radiation safety by national authorities, following the ALARA (As Low As Reasonably Achievable) principle. National and local radiological standards application protects both patients and staff against radiation-induced injuries.

The vascular sheath removal and careful patient observation are the routine of post-procedure phase. Radial artery access enables patients to mobilize immediately after the ICA, femoral access typically requires few hours of bed rest. The femoral vascular closure devices (VCD) have been used for over 20 years to improve patient's comfort and reduce time to ambulation. Recently few studies have demonstrated the lower bleeding rate with VCD use [12,13]. Interestingly, the design of a randomized trial comparing the radial access with femoral artery puncture sealed by VCD has been published [14].

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