Coronary arteriography; prevention of complications in the high-risk patient

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Although complications associated with coronary arteriography have decreased in most centers since 1970, they still occur in 1% to 2% of patients undergoing this invasive procedure. Major accidents include death (0.2%), nonfatal acute myocardial infarction (0.2%), arterial embolization to the central nervous system or peripheral arteries (0.1%), and arterial thrombosis or other types of local vascular injury (0.8% with the femoral approach and more than 1% with the brachial approach).

Systemic emboli and local vascular thrombosis or injury are technical complications related to the introduction of foreign material such as needles, guidewires, and catheters into the systemic circulation. They are also related, however, to factors such as vascular size, integrity, and vasoactivity as well as velocity of blood flow and coagulation factors. Thus, arterial thrombosis occurs frequently in younger persons and in women with or without clinical conditions leading to reduced cardiac output.

Death and nonfatal acute myocardial infarction are more closely related to the coronary anatomy and left ventricular function of the patient than to any other factor. These events are rare in individuals with normal coronary arteries who often represent 20% to 25% of the patient population un-

dergoing coronary arteriography. Most patients have severe narrowing (70%) of two or three major coronary arteries usually associated with various degrees of left ventricular dysfunction. Significant left main coronary artery stenosis (50%), although variable, has been reported in 40% to 80% of patients who die or suffer an acute nonfatal myocardial infarction during or following coronary arteriography. Since left main coronary artery stenosis only occurs in 8% of patients with stable angina and 15% of patients with unstable angina, it represents a high-risk lesion.

A careful investigation before angiography will usually allow the detection and an adequate estimation of left ventricular dysfunction, possibly avoiding the need for coronary arteriography when aortocoronary bypass surgery is not indicated. If angina pectoris is disabling and surgery is contemplated, left ventricular failure can be controlled before angiography and preload and afterload reduction with intravenously administered nitroglycerin and/or nitroprusside can be carried out before, during, and after left ventriculography.

Unfortunately, left main coronary artery stenosis is not usually detected before coronary arteriography. Recognizable clinical features often associated with severe coronary disease and possibly leading to an increased risk at coronary arteriography include disabling stable angina, unstable angina, and ventricular arrhythmias. Before coronary arteriography, these patients should receive the benefit of maximal medical therapy including optimum beta-adrenergic blockade and the administration of nitrates sublingually, cutaneously, or intravenously as required. Coronary arteriography should begin with a nonselective injection in the left coronary cusp to rule out left main coronary stenosis with the first injection. Angulated views are most helpful in assessing the severity of the stenosis: an ostial stenosis is best seen in the 45° left anterior oblique view with a 25° cranial angulation, whereas a 15° right anterior oblique view with a caudal angulation allows a good separation of the proximal branches of the left main trunk. Following the initial flush, the additional injections must remain nonselective in the presence of a severe stenosis. In any case, the number of selective injections should be limited to two or three views for each coronary artery. Nitroglycerin infusion should be used in patients with elevated left ventricular and end-diastolic pressure before left ventriculography and in patients with recurrent chest pain during the procedure.

Among patients with unstable angina, a small high-risk group is characterized by preexisting disabling angina of effort, chest pain unresponsive to aggressive medical therapy, and ST-T changes on the electrocardiogram at rest or during ischemic pain. These patients as well as patients with residual refractory angina after recent myocardial infarction usually require emergency coronary arteriography. Whenever pain cannot be relieved by intravenous nitroglycerin, intra-aortic balloon mechanical assistance may be required.