Selective Coronary Arteriography
by Percutaneous Left Transaxillary Approach
Using Preshaped Torquecontrol Catheters

By J. Edson Price, Jr., M.D., and Josef Rösch, M.D.

SUMMARY
The percutaneous left transaxillary use of preshaped, torquecontrol coronary catheters is considered the technique of choice for selective coronary arteriography in patients with occlusive arterial iliofemoral disease and aortopelvic reconstructive surgery. It affords reliable, selective catheterization of the coronary arteries and their bimodal (cine and serial) examination. Percutaneous left transaxillary selective coronary angiography is a safe and useful technique when performed by experienced and skilled personnel in properly selected patients.

Additional Indexing Words:
Coronary artery disease Left ventriculography Preshaped (Judkins) catheters Seldinger technique

THE JUDKINS TECHNIQUE for percutaneous transfemoral selective coronary arteriography, using specifically preshaped torquecontrol catheters, is a widely accepted procedure which affords consistently easy, stable catheter placement in each coronary artery and allows both cineangiographic and high resolution rapid serial roentgenographic study of coronary disease.1, 2 Carefully performed, it bears minimal risk of local or cardiac complications.3 At times, however, transfemoral catheterization is difficult, impossible or unwise, as in patients with advanced aortoiliac disease or after reconstructive vascular surgery. Under these circumstances, a variety of other techniques from the arm can be used. The procedure pioneered by Sones and Shirey4 and modified by Kaplan, Parker and Marsh5 and Rowe,6 performed from the brachial artery, has been recognized. A percutaneous transaxillary route was used by Hanafee7 and Weidner et al.8 to introduce woven Dacron catheters, while Grollman et al. used the same route for polyethylene catheters controlled by a guide deflecting system.9 Once placed in the coronary ostia, however, the relative instability of the latter catheters usually restricted their use of cineangiography alone. Preshaped, torquecontrol coronary catheters placed percutaneously in the left axillary artery offer positional stability and therefore the ability to obtain a bimodal (cine and serial) examination in patients with occlusive aortofemoral disease. This is shown in the following report of our use of this technique in 38 examinations.

Technique
The left axillary artery is used. The patient is recumbent with the left arm abducted and rotated externally and the hand under his head. A foam pad supports the elbow with the arm in a comfortable position and the axillary area is prepared and draped. Arterial puncture is done about 4–5 cm distal to the palpable fold of the pectoralis major muscle. We consider this relatively peripheral puncture important in preventing complications. Here the axillary artery is relatively superficial and can be stabilized for puncture and compressed against the humerus after catheter removal to prevent bleeding. Puncture is done with a standard 18 gauge needle. A small J-tipped guidewire, preferred in order to avoid entry into small muscular axillary branches or vertebral artery, is advanced directly into the ascending aorta under fluoroscopic visualization. Should it repeatedly enter the descending aorta, the guide is temporarily left in the arch to be manipulated into the ascending aorta with the help of the catheter which is introduced following puncture tract dilatation with a 6 French Teflon dilator. Polyurethane* or polyethylene† torquecontrol catheters,

* Cordis
† Cook
generally 7 Fr. are used. A pigtail catheter is introduced to record aortic pressure and study left ventricular function. When the guide tends to go into the descending aorta, the catheter is positioned in the subclavian artery with its pigtail just reaching into the aorta and oriented to the right side. The J guidewire can then be advanced in the desired direction.

Following pressure studies and left ventricular cineangiography, selective coronary angiograms are done using left and right coronary catheters preshaped in standard Judkins curves. Only in patients with an unusually wide aorta should the right coronary catheter have a more pronounced secondary curve. Catheter placement is accomplished as in the transfemoral technique (simple advancement of the left coronary catheter, slow rotation of the right). For follow-up studies after aortocoronary bypass surgery an H1 cerebral catheter has been useful for selective catheterization and opacification of grafts.

In left transaxillary coronary catheterization, a stable ostial position is achieved since the secondary catheter curve bears against the opposite aortic wall. The patient thus can be moved freely to permit direct serial (large film) recording. Cineangiography is performed in the left anterior oblique (LAO) and right anterior oblique (RAO) projections and direct serial roentgenography is carried out in the lateral and LAO projections, using laterally positioned film changer. RAO filming is done on the AP changer to maintain sterility at the puncture site. Catheter pressure is continuously monitored (except during contrast agent injection and closed-system flushing). When the study is completed the catheter is removed and the puncture site compressed for 15 min or until complete hemostasis is achieved. A pressure dressing is applied and the arm kept in an elevated position for about 4 hr.

Results

At our institutions during the last two years, percutaneous left transaxillary coronary arteriography has been done 38 times in 36 patients (in 2 patients, transaxillary procedures were done before and after aortocoronary bypass surgery). During this same period, 885 conventional transfemoral studies were done.

In 31 patients, the procedure went smoothly and both cineangiography and large films were accomplished with standard curve catheters. In five patients with wide aortas, the usual Judkin's catheter curves were not severe enough to prevent recoil during the injection into the right coronary artery or a left aortocoronary bypass graft. Increasing the secondary curve corrected this occasional instability.

There were no major cardiac or local complications in our series. One patient who had a diskinetic left ventricle with an apical thrombus experienced transient diplopia following ventriculography. Another patient with double aortocoronary bypass grafts whose examination required multiple catheter exchanges, developed transient loss of the pulse in the left arm, probably due to spasm. After stellate ganglion blockade the pulse returned to normal. No neurologic complications were encountered.

Discussion

Percutaneous selective coronary arteriography can be done in the majority of patients by the transfemoral approach. In our institutions this approach could not be used in about 5% (38 out of 681) of patients because of previous reconstructive vascular surgery or because it was not possible to advance a catheter or guidewire through a diseased aortoiliac area. This percentage will probably vary in individual institutions depending on the type of examined patients. In these patients we consider the percutaneous left transaxillary approach and the use of preshaped torquecontrol catheters the technique of choice. We prefer the left axillary artery because it permits the preshaped catheters to assume their intended curves as they pass over the aortic arch and because the mechanics of catheterization, with the catheter stabilized in the ostia of the coronary arteries, are the same as in the transfemoral approach. Early in our experience the right axillary artery was used in two patients but these studies had to be limited to cineangiography because of ostial catheter instability. From the left axillary artery, no major technical difficulties were encountered.

Bleeding from the puncture site is the most frequent complication. Injury to the brachial plexus has also been reported. Other complications such as coronary artery dissection, myocardial infarction secondary to dissection of the coronary artery or embolism and coronary artery spasm can occur. Meticulous catheter technique, early removal of the guidewire, careful flushing of the catheter and proper transaxillary technique can keep the risk of the procedure within acceptable limits.

Selection of Patients

The transaxillary approach should be avoided in patients with bleeding diatheses, in those on anticoagulant therapy (prothrombin time below 50%), and in those with severe arterial hypertension (diastolic pressure above 100 mm Hg). The axillary approach also is less desirable in obese patients because the artery is deep and hemostatic control is likely to constitute a problem. The following
technical guidelines help to minimize the chance of bleeding: the choice of a relatively peripheral puncture, the use of small catheters, and adequate manual compression after catheter withdrawal. Should bleeding occur, prompt surgical intervention with evacuation of the hematoma and arterial repair if needed will help avoid brachial plexus injury and a neurological deficit. A brachial artery approach may be used in those patients who are not candidates for the transfemoral or transaxillary approach.6, 8

References
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