


Stents, antithrombotic agents and vascular complications. Does site of arterial access make a difference?

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Over the last two decades, during the evolution of coronary angioplasty, it has become apparent that the development of catheters and other devices has markedly influenced the incidence of vascular complications at the arterial access site, e.g. bleedings with or without hematoma and need for transfusions, pseudoaneurysms, arterio-venous fistula and dissection. In the early days guiding catheters were large and bulky and were usually inserted without protection of an introducing sheath, which increased the risk of damage to the artery. Miniaturization of devices took place to some extent during the 1980s; however the introduction of stents and directional coronary atherectomy catheters again prompted the need for larger catheters. It also became obvious that these new treatment modalities required a more intense anticoagulation regimen, which further tended to increase bleeding risk. This was clearly demonstrated in the Benestent I trial, where a higher risk of vascular complications at the access site, necessitating surgery or blood transfusion, was noted in stented patients compared with balloon angioplasty patients\([1]\). A similar pattern, with a higher rate of early complications, was seen with directional coronary atherectomy\([2]\). Concomitant use of a bulky cardiac assist device, e.g. the intra-aortic balloon pump, was also a risk factor in this regard.

During the last decade, more potent antithrombotic drugs have been introduced in interventional cardiology. These include glycoprotein IIb/IIIa receptor blockers, in particular abciximab but also more recently integrin and tirofiban. With the use of angioplasty in the acute myocardial infarction setting some patients will have received fibrinolytic agents before the PTCA treatment. To a lesser but probably growing extent direct thrombin inhibitors such as hirudin and hirulog, and the newer low molecular weight heparins, principally enoxaparin and dalteparin, are also being used during the procedure. In the EPIC study, the first large trial with abciximab in coronary intervention, a full dose heparin bolus was given to achieve an activated clotting time of 300–350 s. This resulted in a much higher bleeding rate with abciximab compared to placebo: 14.0% vs 6.6%\([3]\). A similar high incidence of bleeding was found in RAPPORT\([4]\), a study with abciximab in acute myocardial infarction, where the same heparin dose was employed.

Thus, although there have been several factors increasing the tendency towards more bleedings and peripheral vascular complications over the years, there have simultaneously been developments in other directions. On the pharmacological side, we have learnt to optimize the antithrombotic regimen in various ways. The use of the activated clotting time to monitor the dose and effect of heparin during the procedure has been useful in order to avoid excessive levels of anticoagulation with the associated risk of bleeding and also to ensure that a sufficient heparin dose is given to protect from thrombotic complications\([5]\). Use of heparin coated stents also facilitated a less aggressive anticoagulation regimen which reduced the incidence of bleedings without the occurrence of subacute stent thrombosis\([6]\). Another important advance was the demonstration that ticlopidine administration following stent implantation in comparison to conventional anticoagulation therapy with intravenous heparin followed by oral antivitamin K resulted in a reduced incidence of both cardiac events and haemorrhagic and vascular complications\([7]\). These findings have later been corroborated by other studies\([8,9]\). Because of the haematological complications associated with
ticlopidine, however, clopidogrel, having the same mode of action but lacking these side effects, has started to replace ticlopidine in clinical practice. Following the introduction of the potent glycoprotein IIb/IIIa receptor inhibitors it was realized that in spite of the marked effect on prevention of thrombotic events, the incidence of bleeding complications was unacceptable. For that reason, lower weight-adjusted heparin doses were used in subsequent trials with abciximab in EPILOG[10], CAPTURE[11] and EPISTENT[12] resulting in much lower frequencies of vascular complications.

Miniaturization of instruments for angioplasty treatment has played a major role in reducing the risk of haemorrhagic complications during PTCA. The profiles of balloons, stents, atherectomy devices, and ultrasound probes have all diminished over time, allowing for a reduction in the size of guiding catheters. In addition, the use of artery compression devices, local sutures or collagen plugs at the arterial access site has facilitated and increased the security of post-procedural management.

An alternative approach is the use of a radial puncture for arterial access. This technique offers several potential advantages. The radial artery is easily compressible and, provided Allen’s test is negative, occlusion of the radial artery will not result in major complications as compared to what may be the case for brachial artery occlusion. Bleedings can be much more easily controlled than with a femoral or brachial approach. Bed rest is not necessary, accelerating patient ambulation, and allowing for faster discharge. This in turn decreases hospital costs. Catheterizations can, in principle, be performed as outpatient procedures, since the arterial sheath can be removed directly after the procedure. Radial artery catheterization is also more convenient to perform in obese patients and in those with peripheral arterial occlusive disease. Potential downsides of the technique may be occasional spasm of the artery, occlusion post-procedure disallowing repeat catheterizations, and increased radiation exposure to the operators. However, these problems can be minimized using various measures. In a recent randomized 200 patient comparison between transfemoral and transradial catheterization measures of quality of life, e.g. bodily pain, back pain and walking ability favoured the transradial group the first day, and these results were maintained at one week post procedure[13]. There was a strong patient preference for the transradial route and there were also significant reductions in hospital costs.

The practice of the radial access technique has been more widespread in Europe than in the U.S.A. to date. Kiemeneij et al. presented promising results on the feasibility and safety of implantation of coronary stents via the radial artery in 1994[14], and the same group later demonstrated that trans-radial stenting could be performed as an outpatient procedure[15]. In a subsequent randomized trial in 900 patients comparing radial, brachial and femoral techniques, successful coronary cannulation was achieved less frequently with the radial than with the femoral approach; 93.0% vs 99.7%, but there was no difference in the success rate of the PTCA procedure[16]. There were no peripheral vascular complications with radial access compared with a 2.0% complication rate in the femoral access group.

In the current issue, Choussat et al.[17] take one step further and describe their experience with the transradial approach and concomitant treatment with abciximab. All patients, except those presenting with acute myocardial infarction or restenosis, were pretreated for at least 3 days with aspirin, ticlopidine and enoxaparin. The control group consisted of patients undergoing conventional transfemoral catheterization with the same antithrombotic regimen. The vast majority of patients underwent stent implantation. Although the study was not randomized, the results are of considerable interest. Major access site complications occurred in 7.5% of the femoral group and in 0% of the radial group. All patients who had a transradial approach had a palpable radial artery post-procedure, however, Doppler examination was not performed. The duration of hospital stay did not differ between the groups. This was probably due to the fact that the majority of patients had an acute coronary syndrome requiring prolonged hospitalization.

It is important to highlight that in order to achieve the highest rates of success in catheterization and procedural results there is a need for considerable experience with the transradial technique. With this in mind it seems reasonable to assume that the use of this method will become increasingly widespread in the future. The use of combinations of potent antithrombotic agents will certainly also increase, making the need for safe and simple arterial access even greater. Shortening of hospital stay is another driving factor.

It has been fascinating to watch over two decades how an intervention such as coronary angioplasty has evolved from being a complex, cumbersome and time-consuming operation to an outpatient procedure where the patient can leave the hospital after a few hours — almost like going to the dentist.

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Determining prognosis early after a myocardial infarction

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In the first 24 h after an acute myocardial infarction, several features of the illness can be associated with a good or poor prognosis[1]. For example, patients in Killip Class IV have a worse prognosis than patients in Killip Class I. Patients with a third heart sound or pulmonary rales, ventricular tachycardia or severe hypotension have a poorer prognosis than patients without these features. Patients with a large number of abnormal ECG leads have a poorer prognosis than those with a few abnormal leads. Patients whose chest X-ray shows pulmonary oedema or cardiomegaly are at higher risk than those whose lungs are clear and the heart is small. Prognosis might be expected to be poor if the initial creatine kinase or Troponin I was markedly elevated. Post infarction angina also identified a high risk population.

The following two case examples illustrate the extremes of prognosis in which further risk stratification may not be necessary.

Example 1. 45-year-old male, no previous angina develops an inferior myocardial infarction with a small creatine kinase rise. He has no arrhythmias, no heart failure, no symptoms after initial treatment. Chest X-ray reveals a small heart, normal lung vascularity. An electrocardiogram shows Q waves in the inferior leads. This patient’s prognosis is very good.

References