Surgical cover for percutaneous transluminal coronary angioplasty

The Council of the British Cardiovascular Intervention Society

Surgical cover for coronary angioplasty can be an emotive subject. All who practise percutaneous transluminal coronary angioplasty or provide emergency surgical cover are concerned that the procedure should be performed as safely as possible. To this end many consider that it is essential to have surgical facilities at the same hospital—so-called on site surgery—so that if a vessel occludes during percutaneous transluminal coronary angioplasty, emergency coronary artery bypass grafting can be promptly effected. Some consider that there may be insufficient time for a patient to travel from one hospital to another in an ambulance to have emergency surgery. In 1990 Parker expressed the view that "It is more appropriate for the cardiologist to travel by car than for patients with acute myocardial ischaemia (who perhaps will require cardiopulmonary resuscitation) to travel by ambulance".¹

The joint recommendations of the American College of Cardiology and the American Heart Association are that on site surgical cover is essential for percutaneous transluminal coronary angioplasty.² In France and Germany large numbers of percutaneous transluminal coronary angioplasties are done without on site cover.³ This topic was initially brought to the British Cardiovascular Intervention Society to consider the safety and medico-legal status of centres in the United Kingdom performing percutaneous transluminal coronary angioplasty without surgical cover on site.

Need for emergency cardiac surgery for percutaneous transluminal coronary angioplasty

With increased experience and improved equipment the need for emergency surgery has fallen considerably. In the United States the National Heart, Lung and Blood Institute Registry recorded that the rate for emergency surgery during percutaneous coronary angioplasty fell from 5.8% between 1979 and 1981 to 3.4% in 1985.⁴ In the United Kingdom Shiu *et al* reported an emergency surgery rate of 6.6% for cases between 1983 and 1985.⁵ In 1989 from all United Kingdom centres the British Cardiovascular Intervention Society recorded an emergency surgery rate of 2.1%.⁶ From 63 American centres in 1990 the emergency surgical rate was 1.6%.⁷

The transfer of a patient to a theatre while being given external cardiac massage is now rarely required. With current experience, techniques, and devices, it is usually possible at least partly to re-establish blood flow if a vessel does occlude. The vessel may already have a guide wire across the dissected region, or it may be possible to re-cross the occlusion. A Stack or another perfusion balloon may restore flow. Stents are becoming more readily available as bail-out devices. The circulation can be supported by an intra-aortic balloon pump or by a cardiopulmonary support system. For high risk cases these support systems can be established before the start of coronary angioplasty. In at least half the cases in which the vessel becomes occluded it is possible to re-establish adequate flow with modern devices without the need for emergency coronary artery bypass surgery.^{8,9} If surgery is needed, it is usual for the patient to be haemodynamically stable and immediate or instant surgery is rarely needed.

On site cardiac surgery

Having surgical facilities on site may not necessarily guarantee immediate or even prompt surgery. There may be no theatre available nor a surgical team. Except for high risk cases many, if not most, centres in the United Kingdom performing percutaneous transluminal coronary angioplasty do so without a free theatre and a surgical team standing by. Because the risk of needing these facilities is approximately 2%, or less in some centres, it is uneconomic to have these facilities left idle. Many centres arrange percutaneous transluminal coronary angioplasty to coincide with the end of one surgical case and before the start of the next. This arrangement can fail if a complication develops in the late stages of the first surgical operation or if the patient having percutaneous transluminal coronary angioplasty develops late vessel occlusion after the start of the second surgical operation. Some centres with on site surgery do not have surgical facilities in the same building. Hence the availability of surgical cover provided by units with on site surgery may be quite variable.

It is quite possible that a centre with off site surgical facilities but with a well thought out and effective plan for transferring a patient to an operating theatre in a surgical centre may

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Percutaneous transluminal coronary angioplasty in the United Kingdom 1989 and 1990: comparison between centres with on site and off site surgical facilities

Data	On site		Off site	
	1989	1990	1989	1990
Centres	45	45	6	6
Numbers	6146	7878	425	581
Mortality	40 of 6146 (0.65%)	56 of 7259 (0.77%)	3 of 425 (0.71%)	0 of 581
Emergency coronary artery bypass surgery	130 of 6146 (2.1%)	161 of 7259 (2.2%)	6 of 425 (1.4%)	6 of 559 (1.1%)
Myocardial infarction	116 of 4861 (2.4%)	115 of 6139 (1.9%)	6 of 425 (1.4%)	13 of 559 (2.3%)

be able to match the time to revascularisation that can be achieved with well organised on site surgery.¹⁰ Reviewing the subject of surgical cover for the British Cardiovascular Intervention Society, a barrister wrote “It is recognised that the key to effective surgical cover, whether on site or off is the rapid transfer of the patient and the prompt availability of theatre and surgical staff ”.

Results from the United Kingdom centres with off site surgery

The British Cardiovascular Intervention Society in the 1989 and 1990 audits of interventional procedures in the United Kingdom assessed the results from the six centres performing coronary angioplasty without surgery on site.^{6,11} The mortality for percutaneous transluminal coronary angioplasty from these centres was not significantly different from that in centres with surgery on site. The need for emergency coronary artery bypass surgery was less for centres with off site surgery and this was not at the expense of more myocardial infarctions (table). It is accepted that the cases from the two types of centre were not identical and that only a controlled trial could fully assess the results from the two types of centre. The important fact, however, is that with case selection, appropriate techniques, and transport arrangements there was not a significantly higher mortality or other complications with surgery off site.

Case selection of patients having percutaneous transluminal coronary angioplasty with off site surgery

Shaw in the United Kingdom¹² and Morice in France¹³ showed that a wide range of cases can be dilated safely without on site surgery. While a high risk case can be identified it is more difficult to predict the haemodynamic consequence of vessel occlusion in a low risk case—for example, a single vessel percutaneous transluminal coronary angioplasty in single vessel disease. Hence a low risk patient may need prompt surgery as much as one predicted to be of high risk. The operator should choose, in the light of his or her experience and available facilities, which cases should be attempted.

Training for percutaneous transluminal coronary angioplasty

If case selection does not need to be determined solely by the presence or absence of surgical facilities on site, nor should training for percutaneous transluminal coronary angioplasty be restricted to centres with on site surgical facilities. The number, variety and complexity of procedures are the relevant features for training. Training for percutaneous transluminal coronary angioplasty at centres with on or off site surgical facilities is discussed in greater detail in the paper from the Council of the British Cardiovascular Intervention Society on Training for Percutaneous Transluminal Coronary Angioplasty.¹⁴

On site cardiac surgery the strongly preferred option

While percutaneous transluminal coronary angioplasty can be done safely with off site surgery, the need to transport a patient to another hospital complicates the procedure. This is why the British Cardiovascular Intervention Society considers that **on site surgery is the strongly preferred option**. For a new centre starting up percutaneous transluminal coronary angioplasty the British Cardiovascular Intervention Society recommends that on site surgery is to be strongly preferred. The British Cardiovascular Intervention Society does, however, support those centres that perform percutaneous transluminal coronary angioplasty with surgery off site and considers that it is both safe and ethical, provided that reliable arrangements to allow prompt transfer to a theatre and surgeon are in place. These views are similar to those expressed in two recent reports which discussed surgical cover for angioplasty, namely the Report of a Working Party of the British Cardiac Society on Coronary Angioplasty in the United Kingdom³ and the Fourth Joint Report of the Provision of Services for the Diagnosis and Treatment of Heart Disease.¹⁵

Length of time to revascularisation

The sooner revascularisation can be performed after a vessel occlusion the better and the less ischaemic damage will result. However, to give an upper maximal time limit is not appropriate because this will depend on the haemodynamic state of the patient and will also vary with the time spent in the catheter room while attempts are made to re-open the artery.

Other safety factors relevant to percutaneous transluminal coronary angioplasty

The availability of surgical cover for percutaneous transluminal coronary angioplasty though an important safety factor is not the only one. The quality of the x ray equipment can greatly influence the assessment of the procedure and results of percutaneous transluminal coronary angioplasty. The experience of the operator and the whole catheter room team—that is, nurse, physiological measurement technician, and radiographer—has an important influence on the safety of percutaneous transluminal coronary angioplasty.

Newer interventional procedures

Surgical cover for percutaneous transluminal coronary angioplasty has mainly been considered for dilatation procedures with a balloon. With balloon dilatation vessel perforation is rare. With debulking procedures (such as atherectomy, lasers, and drills) as well as the risk of vessel occlusion there is the additional risk of vessel perforation and possible cardiac tamponade.^{16–18} Some devices are relatively rigid and may require larger than usual guide catheters; these features lead to the risk of vessel wall damage and occlusion at a site away from the target lesion.¹⁸ Many operators practising debulking procedures are still on the learning curve of their experience with these relatively new devices. For these reasons particular care over surgical cover should be taken for patients in whom debulking devices are to be used.

Recommendations of the British Cardiovascular Intervention Society on surgical cover for percutaneous transluminal coronary angioplasty

The topic of surgical cover for percutaneous transluminal coronary angioplasty has been discussed by the Council of the British Cardiovascular Intervention Society and at the scientific meetings of the society. Opinions have been obtained from a barrister and from a physician specialising in medico-legal subjects. As a result of all these discussions the British Cardiovascular Intervention Society makes the following recommendations about surgical cover for percutaneous transluminal coronary angioplasty:

- 1 The aim of surgical cover for percutaneous transluminal coronary angioplasty is to provide re-vascularisation after vessel occlusion and to treat other complications such as vessel perforation. To enable emergency surgery to be performed as quickly as possible **on site surgery is the strongly preferred option.**
- 2 It is recognised that percutaneous transluminal coronary angioplasty can be performed properly and safely without on site surgery with results that are comparable to those for units that have surgical facilities on site.

For units without surgery on site reliable arrangements to allow prompt transfer of the patient to a suitable operating theatre and surgeon are essential. Transfer should be in an ambulance with staff and equipment to allow for cardiac resuscitation and support.

3 There should be a close and regular liaison between cardiologists and radiologists performing percutaneous transluminal coronary angioplasty and the cardiac surgeons to whom a patient may need to be transferred in an emergency.

4 It is recognised that the key to effective surgical cover, whether on site or off, is the rapid transfer of the patient and the prompt availability of theatre and surgical staff.

The British Cardiovascular Intervention Society considers that these recommendations may need modification in the light of further experience in the practice of percutaneous transluminal coronary angioplasty.

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