Srinagarind Med J 1996; 11(2) 47-49

ENDOVASCULAR STENTING FOR TREATMENT OF ABDOMINAL AORTIC ANEURYSM

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ABSTRACT

Abdominal aortic aneurysm (AAA) can now be treated by endovascular introduction of a prosthetic vascular graft via femoral arteriotomy, with fixation to the aorta above and below the aneurysm using expandable metal stents. This will exclude the anurysm from the circulation and prevent rupture.

INTRODUCTION (BACKGROUND)

The incidence of AAA has risen over the last 30 years and it now affects 3% of the population over the age of 50. Most AAAs are asymptomatic until they become large or rupture, a condition which is lethal if untreated. The risk of rupture is proportional to the size of the aneurysm, hence in units where facilities exist, elective surgical repair is offered to patients with AAAs of greater than 5.5cm diameter (if they are considered fit enough for surgery). However, although elective surgery is often successful some units do not have facilities suitable for such major surgery. In addition, there is a large group of patients with poor cardiorespiratory reserve who are denied surgery because elective mortality rates have been show to be as high as 60% in this population.

Within the last few years endovascular treatments for AAA have been developed which may reduce the risks, costs, and provide alternative treatments to high risk patients. At present these techniques require sophisticated imaging equipment and are only performed in major vascular centres, but it is likely that within the next few years these procedures will become less expensive, more widely disseminated, and may provide a method of treatment to a population of patients who would have previously not been treated.

THE TECHNIQUE

Endovascular surgery utilises catheter-based systems delivered into the vascular tree for therapeutic intervention remote from the site of entry. Animal studies demonstrated that it was possible to introduce a prosthetic vascular graft via the femoral artery into the aorta and bypass experimental aneurysms (1). These initial experiments ware followed by clinical studies, in which dacron tube grafts sutured to balloon-expandable stents (stent-grafts) were successfully used to bypass AAA in humans (2). In these studies the graft was fixed against the aortic wall above the aneurysm, but below the level of the renal arteries; and below the aneurysm, but above the aortic bifurcation.

Endovascular repair of AAA is performed by transfemoral placement of an intraluminal prosthetic graft into the infrarenal aorta to exclude the aneurysm from the circulation. The graft is attached to the aortic wall above and below the aneurysm by metallic stents. Various stents are available for this purpose. Initially aorto-aortic tube graft repairs were developed, but more recently bifurcated, and tapered aortoiliac grafts have been described (3,4).

All stent-grafts consist of a tube (or bifurcated), dacron graft attached to balloon-expandable (eg Palmaz) or self-expandable (eg Gianturco-Z) stents. The stent-graft is introduced after mounting is on a suitable deployment system (a balloon catheter for balloon-expandable stents, or a pusher rod for self-expandable stents). The whole system is then packaged into a co-axial sheath prior to introduction.

The technique is performed under general, regional or local anaesthesia with the patient supine on the operating table. A cut-down is performed on a femoral or iliac artery and control is obtained using slings. A guide wire is then inserted through an arteriotomy, and advanced under fluoroscopic control into the aorta and through the aneurysm. The endovascular graft within its protective sheath is then advanced over the guidewire into the infrarenal aorta. The graft is deployed by withdrawing the sheath whilst expanding both proximal and distal stents, under fluoroscopic control, to attempt to ensure accurate graft placement. The aim is to deploy both stents in healthy aorta, with the proximal stent below the renal arteries.

DISCUSSION

There are a number of advantages to the endovascular approach. Avoidance of laparotomy should lead to a lower incidence of post operative cardiac, pulmonary, renal and gastrointestinal complications, and reduce postoperative pain. Aorto-enteric fistulae would be prevented as the graft lies entirely within the aorta, whilst avoiding open dissection will eliminate the risk of surgically-induced impotence. Complications of general anaesthesia (in a population of patients who frequently display significant cardiorespiratory comorbidity) can be avoided as the endovascular technique can be performed under local anaesthetic. Reduced requirements for blood transfusion may decrease the risk of blood-borne infection. During endovascular repair the aorta is only occluded for a few seconds whilst the stents are deployed. Thus the abrupt rise in left ventricular end diastolic pressure that occurs during aortic clamping in conventional repair is avoided. This may reduce the risk of cardiac dysfunction. Aside from decreased mortality and morbidity it is anticipated that endovascular repair may be associated with a reduced hospitalisation time (less than 24 hours) and shorter convalescent period after discharge, which could represent a considerable economic advantage.

Despite the first endovascular repair of AAA having been reported in 1990, at the time of writing the combined world experience amounts to a little under 300 cases. Difficulties with the technique relate to limitations of the prostheses and anatomical differences between the patients. Further developments in stent-graft technology and radiologic imaging are imminent and may overcome the problems of accurate graft positioning and reliable graft fixation. The development of shape memory alloy stents may overcome some of the problems of introduction through narrow and tortuous arteries and could even facilitate percutaneous introduction. It is likely that within the next few years endovascular stent-graft placement will provide cheaper, simpler and safer management and become the treatment of choice for AAA.

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