6. Endovascular aneurysm repair

Introduction

The standard treatment for aortic aneurysm, open repair, involves a large abdominal incision and cross-clamping of the aorta. In recent years, a minimally invasive technique, endovascular aneurysm repair (EVAR) has been developed: a graft is placed in the aorta via the femoral arteries, without an abdominal incision and with much smaller changes in cardiovascular haemodynamics. Potential advantages over open repair include reduced morbidity and mortality, the possibility of operating on patients unfit for open surgery, and reduced length of hospital stay.

This new procedure is the subject of ongoing trials to determine whether or not EVAR has advantages over conventional surgery and in what circumstances. NCEPOD felt it was important to include EVAR in this study of the management of aortic aneurysm repair. Unfortunately data were received on only 53 endovascular repairs so the conclusions that can be drawn are limited and no recommendations have been made. The results of two major trials of EVAR in the UK have now been published. EVAR 1 randomised suitable patients between endovascular and conventional repair. The 30 day operative mortality after an endovascular approach was reduced by two thirds compared to open surgery [1]. However, after a median follow up of 3.3 years it was clear that patients who underwent an endovascular repair were much more likely to need further intervention and all cause mortality did not differ significantly between the two groups [2].

The EVAR trial 2 randomised patients between endovascular repair and observation. All patients were considered ‘unfit’ and at high risk of mortality with a conventional aneurysm repair. The 30 day mortality after endovascular repair was 9% compared to 1.7% in the EVAR 1 trial. Analysed by intention to treat there was no reduction in mortality compared to the control group after a median follow up of 2.4 years [3]. At present, the cost of endovascular repair is greater than that of open repair and the long term outcomes remain uncertain.

6. Endovascular aneurysm repair

Demographics

92% (49/53) of patients undergoing EVAR were male. The age range was from 59 to 88 years (Figure 1).

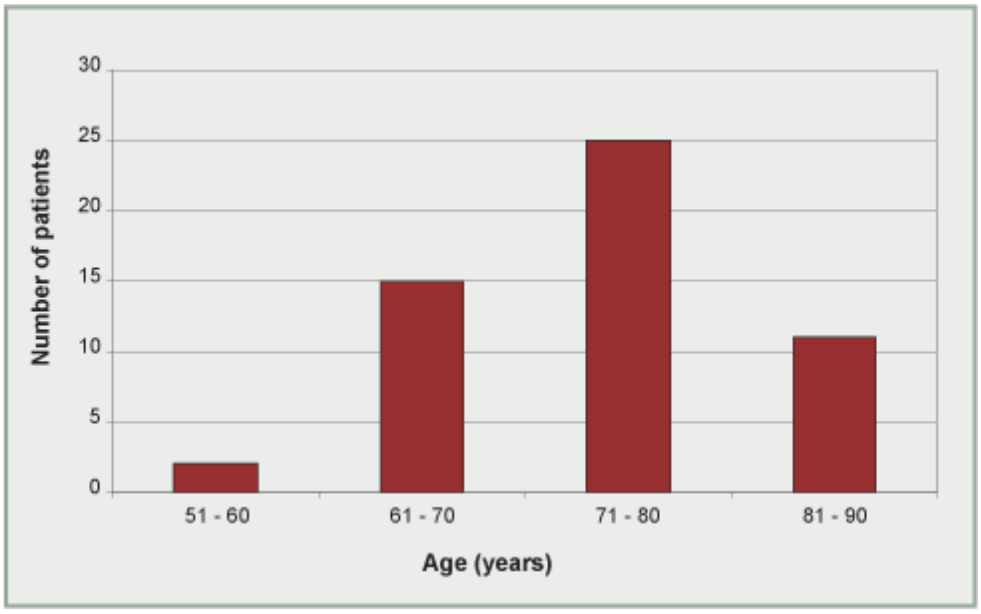

Figure 1. Age of endovascular patients *n=53*

43 were admitted for an elective procedure, three were emergencies, and one an emergency transfer. The method of admission for the remaining six cases was unknown.

6. Endovascular aneurysm repair

Reason for decision to treat with endovascular repair

NCEPOD asked what factors influenced the decision to opt for endovascular repair. The most frequent reason given was the fitness of the patient as graded by the American Society of Anesthesiologists (ASA) classification (Figure 2).

46 patients had a bifurcated graft, three aorto-uni-iliac and four had other unspecified grafts.

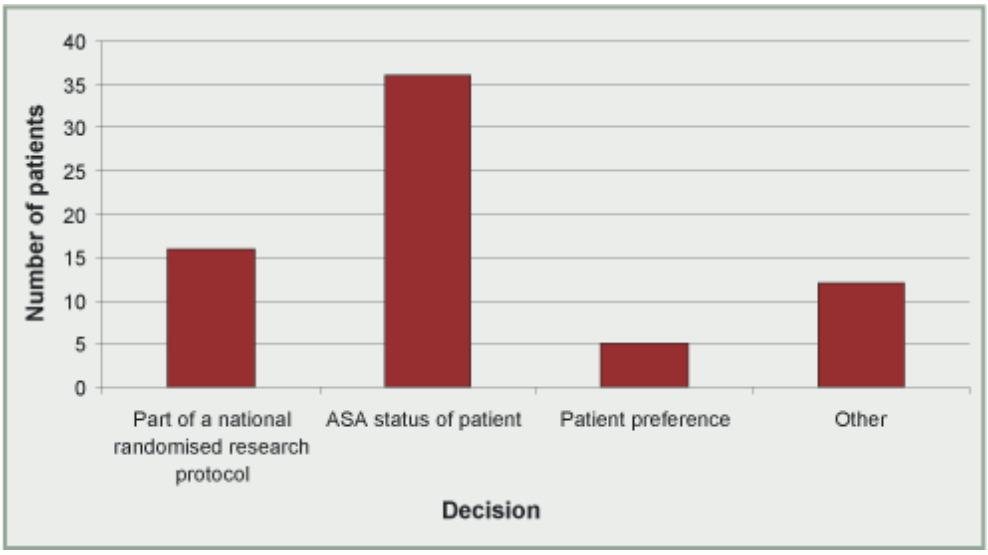

Figure 2. Decision to treat by stent graft *n=53. Answers may be multiple.*

6. Endovascular aneurysm repair

Participation in trials

As discussed in the previous page, at the time of this study there were ongoing trials to establish the place of endovascular repair in the management of aortic aneurysm. In addition, it has been recommended that all cases involving endovascular repairs should either be entered into one of the trials or else information about the case should be entered on an endovascular repair registry. NCEPOD asked whether the patient had been entered into a trial. 30% (16/53) of cases had been entered into a trial, 11 cases were enrolled in the EVAR 1 trial and five in the EVAR 2 trial. It is not known how many of the other cases had been placed on the registry.

6. Endovascular aneurysm repair

Status of aneurysm

Table 1. Status of aneurysm on admission

Status	**Total**	%
Unruptured: asymptomatic	48	91
Unruptured: symptomatic	4	8
Ruptured	1	<2
Total	**53**	

The great majority of aneurysms were unruptured and asymptomatic. The advisors suggested that at present very few centres in the United Kingdom are able to treat ruptured aneurysms by EVAR. Successful endovascular treatment of a ruptured aneurysm requires that the patient is cardiovascularly stable, so that they can proceed immediately to CT examination, and then to a staffed angiography suite. It is difficult for radiology departments to organise this flexibility of service with current workload and staff resources.

6. Endovascular aneurysm repair

Length of procedure

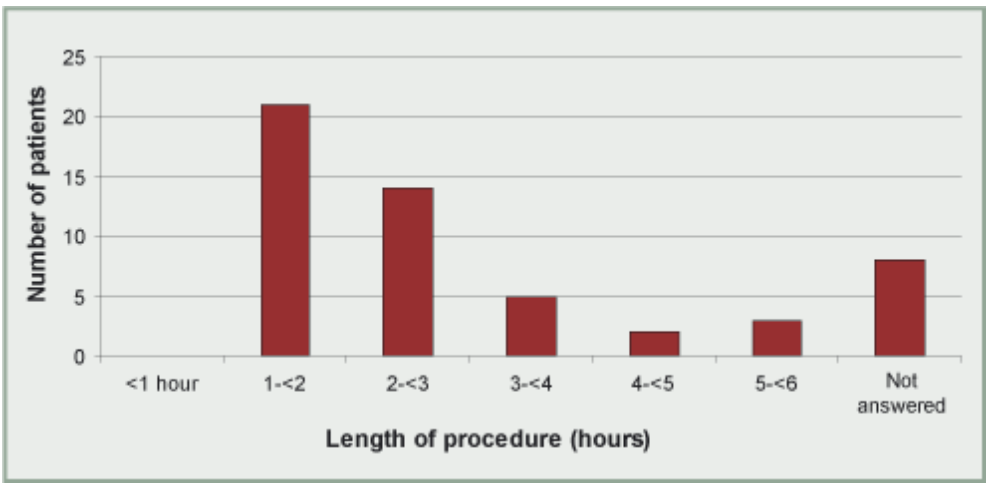

Figure 3. Length of the procedure *n=53*

The length of procedure was calculated from the time of the first angiogram to groin closure. As can be seen the reported length of endovascular repair was very variable with some cases being very prolonged.

Other interventions performed at the time of surgery included femoro-femoral crossover (3), internal iliac embolisation (3), additional cuff insertion (3), and other unspecified and infrequent procedures (4).

6. Endovascular aneurysm repair

The radiologist

All endovascular repairs were performed by a consultant.

All the endovascular repairs were done by a consultant radiologist. In 46 cases the radiologist described themselves as a vascular radiologist and in the other seven cases as a general radiologist with a vascular interest. This represents excellent care. NCEPOD is aware that vascular surgeons participate to expose the femoral arteries and close arteriotomies, and some vascular surgeons have been trained in, and do perform, stent insertion.

The radiologist was asked to supply information on how many endovascular repairs they had done in 2002/03, and the source of that information.

Table 2. Source of information about the most senior radiologist responsible for the decision to treat the aneurysm by endovascular repair

Source	Total	%
Logbook / Information system	32	62
Memory	20	38
Sub-total	**52**	
Not answered	1	
Total	**53**	

It is worrying that in a third of cases (20/52) radiologists were unable to provide an accurate record of their workload for this novel procedure.

Figure 4 shows the number of cases where the radiologist performed no elective endovascular repairs in 2002/03, the number of cases where the radiologist performed between one and five, and so forth.

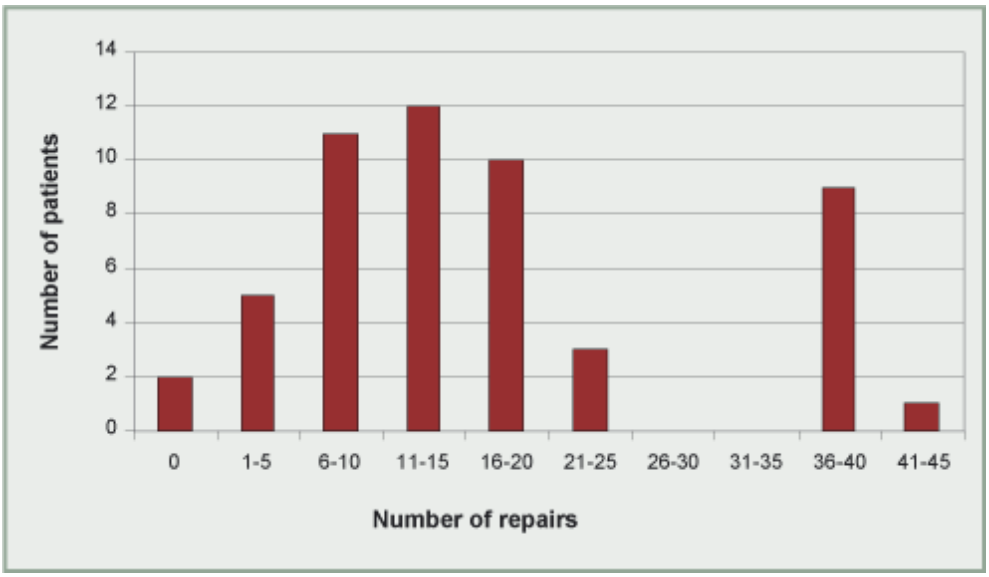

Figure 4 . Endovascular repairs performed by the most senior radiologist, April 2002-March 2003
n=53

Some radiologists may have returned more than one questionnaire. Most radiologists seem to have been performing a reasonable number of cases a year. It is possible that the radiologists

performing small numbers in 2002/03 had only just begun to do endovascular repairs and that their workload in succeeding years has been greater. Circumstances may be changing rapidly depending on how quickly endovascular services are expanding.

Because of the small numbers of returns, no attempt has been made to correlate the experience of the radiologist with the number of complications or the overall outcome.

6. Endovascular aneurysm repair

Anaesthesia grade and type

86% of anaesthetics for endovascular repair were given by a consultant.

Table 3. Grade of the most senior anaesthetist present at the start of anaesthesia *n=53*

Grade of anaesthetist	**Total**	%
Consultant	44	86
SpR year 3+	6	12
SpR year 1/2	1	2
Sub-total	**51**	
Not answered	2	
Total	**53**	

As with open repair, the great majority, 86% (44/51), of cases were done by consultants.

An epidural catheter was placed in 33% (17/51) of patients with an unruptured aneurysm. In one case the question was unanswered. The only patient with a ruptured aneurysm was managed without an epidural.

As has been shown, endovascular repairs can take several hours. If the team are confident that the procedure will be relatively short then it is reasonable to use epidural anaesthesia, but some patients may have difficulty tolerating procedures lasting more than two or three hours without general anaesthesia.

6. Endovascular aneurysm repair

Destination after the procedure

Only one patient went to a Level 3 Intensive Care bed after the procedure.

Table 4. Immediate destination of patients after endovascular repair

Destination	**Total**	%
Recovery area	21	40
ICU	1	2
HDU	25	48
Vascular surgical ward	5	10
Sub-total	**52**	
Not answered	1	
Total	**53**	

Only one patient was admitted to ICU after the procedure. This compares with 56% of elective open repairs in this study who went to Level 3 care after surgery. The reduced requirement for critical care beds after EVAR is a secondary benefit to the service, which may help to free the resource for other patients and reduces the chance of other operations being cancelled because no critical care bed is available. Whether or not a patient goes to a recovery area may depend on local factors including the proximity of the angiography suite to theatres.

6. Endovascular aneurysm repair

Complications

The morbidity of endovascular repair was reduced compared to open repair.

14 patients developed an endoleak, most commonly type II where there is retrograde filling of the sac by patent aortic side branches (Table 5).

Table 5. Postoperative complications within 30 days of endovascular repair *n=53. Answers may be multiple*.

Type	Total
Type I endoleak	5
Type II endoleak	8
Type IV endoleak	1
Limb occlusion	3
Returned to suite for further endovascular treatment	1
Other	2

One endovascular patient suffered a myocardial infarction compared to 7% (31/428) of patients who underwent an elective open repair. Infection was less common than with open repair as 9% (4/47) of patients had a chest infection after endovascular repair while 14% of elective open repair patients were reported to have had a chest infection. 4% (2/47) of patients had postoperative renal impairment compared to 10% of elective open repair patients. There were no complications reported for stroke, paraplegia or ischaemic bowel.

6. Endovascular aneurysm repair

Outcome

All the patients on whom we had data were alive at 30 days.

No outcome was reported for six cases. The remaining 47 patients survived to 30 days after the procedure. 45 had been discharged and two were alive but still in hospital at 30 days. NCEPOD has no information as to why these two patients were still in hospital at 30 days. The 30 day mortality rate for elective open aneurysm repair in this study was 6.2%.

Although the numbers are small, the findings of this study are consistent with other published work, that short term morbidity and mortality are much reduced after endovascular aneurysm repair compared to open repair.

6. Endovascular aneurysm repair

References

1 Greenhalgh RM, Brown LC, Kwong GP *et al. Comparison of endovascular aneurysm repair with open repair in patients with abdominal aortic aneurysm (EVAR trial 1), 30 day operative mortality results: randomised controlled trial.* Lancet. 2004; **346**: 843-48.

2 EVAR trial participants. *Endovascular aneurysm repair versus open repair in patients with abdominal aortic aneurysm (EVAR trial 1): randomised controlled trial.* Lancet. 2005; **365**: 2179-86.

3 EVAR trial participants. *Endovascular aneurysm repair and outcome in patients unfit for open repair of abdominal aortic aneurysm (EVAR trial 2): randomised controlled trial.* Lancet. 2005; **365**: 2187-92.