Editorial

Coronary artery bypass grafting and hyperlipidaemia

GILBERT THOMPSON,* RALPH SAPSFORD†

From the *MRC Lipoprotein Team and †Department of Surgery, Royal Postgraduate Medical School, London

The widespread introduction of saphenous vein grafting to bypass atheromatous lesions of the coronary arteries over 15 years ago¹ has had a profound effect on the management of ischaemic heart disease. It has been estimated that 65 000 such procedures were carried out in the United States of America during 1975,² and the annual rate has probably risen appreciably during the subsequent decade. The benefits of coronary artery bypass grafting have been the subject of much debate, but there is now increasing evidence that this procedure not only relieves symptoms but also increases longevity.³

Need for grafting in hyperlipidaemic patients

Numerous studies have shown a relation between the severity of angiographically assessed coronary artery disease and hyperlipidaemia,⁴⁻¹⁴ as judged by the age of onset of symptoms,^{4,7} the multiplicity of vessels involved,^{5,7} and the tendency for lesions to progress.^{6,10} Angiographic abnormalities are associated more closely with hypercholesterolaemia than with hypertriglyceridaemia^{7,9,12} and correlate inversely with the ratio between high density lipoprotein (HDL) cholesterol, especially its HDL₂ subfraction, and low density lipoprotein (LDL) cholesterol.¹³ Increases in LDL cholesterol and decreases in HDL cholesterol are each independently associated with the severity of disease¹⁴ and often occur together in patients with type II hyperlipoproteinaemia, especially when this is due to familial hypercholesterolaemia. Such individuals are known to have an especially high frequency of three vessel and left main stem disease.^{15,16} In view of the evidence that coronary artery bypass grafting exerts its greatest impact on prognosis in just these categories of coronary artery disease,^{17,18} this implies that the indications for carry-

ing out this procedure will occur relatively more often in hypercholesterolaemic patients than in those with normal serum lipid concentrations. In individuals with the rare homozygous form of familial hypercholesterolaemia bypass grafts are performed prophylactically to minimise the hazards of the ostial stenosis to which they are so prone or as an accompaniment to the formidable procedure which involves excision of the atheromatous aortic valve, enlargement of the aortic annulus, and insertion of a Björk-Shiley prosthesis.¹⁹

Effect of hyperlipidaemia on saphenous vein grafts

An early study²⁰ suggested that grafts patent at two weeks occluded more frequently during the subsequent year in patients whose serum triglyceride concentrations were raised preoperatively or postoperatively than in those with normal values. This was attributed to the fact that hypertriglyceridaemia tends to be associated with hypercoagulability, as was confirmed recently,²¹ thus predisposing to early thrombotic occlusion. Histological studies of grafts obtained at the time of reoperation or necropsy several years after the initial procedure showed atheromatous changes which were largely confined to individuals who remained hyperlipidaemic postoperatively.^{22,23} A similar but larger study showed a five fold increase in the incidence of vein graft atheroma in hyperlipidaemic compared with normolipidaemic individuals dying 1-5 years after coronary artery bypass grafting.²⁴

Recently, three angiographic studies with varying periods of follow up have been reported. The largest but shortest study found that the majority of grafts patent at one year were unchanged three years after operation.²⁵ Progression of disease in grafts was evident in only 11% of 221 patients and was unrelated to serum cholesterol concentration. Nevertheless, a longer study showed progressive narrowing in 44% of grafts by five years, especially in hyperlipidaemic

Requests for reprints to Dr G R Thompson, MRC Lipoprotein Team, Hammersmith Hospital, Ducane Road, London W12 0HS.

Figure Coronary angiograms of a saphenous vein graft to the left anterior descending artery showing (a) normal appearance at one year, (b) minimal narrowing at six years (black arrow), and (c) severe stenoses at 10 years (white arrows). (Source: Campeau *et al*²⁷ by permission of the American Heart Association, Inc.)

patients.²⁶ The longest follow up to date has been reported by Campeau *et al*.²⁷ Of 132 grafts shown to be patent at 6–18 months, 38% were unchanged at 10–12 years, 32% had changes suggestive of atherosclerosis (Figure), and 30% had completely occluded. The annual occlusion rate was 2.1% during the first five years and 5.2% thereafter. Concentrations of LDL cholesterol and LDL-apoB, the significance of which has been discussed recently,²⁸ were higher and HDL cholesterol concentrations were lower in patients with graft atherosclerosis than in those without.²⁹ The functional consequences of late graft closure are emphasised in a recent report which shows that the beneficial effect of coronary artery bypass grafting on longevity is demonstrable at seven years but not after 11 years of follow up.³⁰

Effects of treatment

Data on the effects of treatment on graft patency are scanty and sometimes conflicting. Pantely *et al* reported the failure of antiplatelet or anticoagulant treatment to influence graft patency during the first six months after grafting³¹ but two subsequent studies showed that dipyridamole combined with a high dose of aspirin³² or a low dose of aspirin given alone³³ significantly improved graft patency during the first postoperative year. Whether treatment of hyperlipidaemia exerts any beneficial effects on graft survival remains to be established. The recently reported National Heart, Lung and Blood Institute type II intervention trial suggests that reducing LDL cholesterol and increasing HDL cholesterol concentrations by cholestyramine retards the progression of estab-

lished disease in native vessels,^{34,35} and it seems probable that a similar effect could occur in vein grafts. If this is not the case then the likelihood is that a high proportion of hyperlipidaemic patients will require further surgery within 10 years of first receiving a graft, with all the risks and expense that this entails. For the present it would seem sensible to give antiplatelet treatment to all patients for at least a year postoperatively and to identify and treat hyperlipidaemia on a long term basis.

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