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Arterial Revascularisation Trial - a randomised trial to compare survival following bilateral versus single internal mammary artery (IMA) grafting in coronary revascularisation

Submission date
19/10/2004

Recruitment status
No longer recruiting

Registration date
17/01/2005

Overall study status
Completed

Last Edited
25/09/2026

Condition category
Circulatory System

[_] Prospectively registered
[X] Protocol
[_] Statistical analysis plan
[X] Results
[_] Individual participant data

Plain English summary of protocol

Current plain English summary as of 26/10/2021:
Background and study aims
A coronary artery bypass graft (CABG) is a surgical procedure that diverts blood around narrowed or clogged arteries of the heart to improve blood flow and oxygen supply to the heart. CABG surgery provides excellent short- and intermediate-term success in treating coronary heart disease but its long-term success may be limited by failure of the veins that have been used to bypass the blood vessels of the heart. Ten years after CABG, around ½ of vein grafts have become blocked or diseased although current drug therapy such as aspirin and statins (which lower cholesterol) may reduce this failure. Blocked or diseased vein grafts means that the patient may develop recurrent angina (chest pain) and may require further treatment including the possibility of another operation. The artery grafts last better than the vein grafts. There is some circumstantial (but no definite) evidence that if both of the mammary arteries are used in the CABG operation instead of just one it may improve the longer-term outcome. The aim of this study is to determine if the use of both mammary arteries improves survival, and reduces the chance of recurrent angina and/or the need for further intervention (including surgery) compared to using one mammary artery. Patients will be followed up for 15 years after surgery.

Who can participate?
CABG patients with coronary heart disease.

What does the study involve?
Patients are randomly allocated to receive either a single internal mammary artery (SIMA) graft or a bilateral internal mammary artery (BIMA) graft during their CABG surgery. Patients are then followed up every year for up to 10 years after their surgery to collect data on their health status and quality of life, and then again at 15 years after surgery to determine their health status.
What are the possible benefits and risks of participating?
The possible disadvantages and risks of taking part are common to all patients undergoing CABG

surgery. The possible disadvantages of BIMA grafting is that there may be a slightly increased risk of poor wound healing. The risk of poor wound healing with the standard SIMA operation is 1%-2% and this may increase by a further 1% in the BIMA group. However, this is usually only a problem in those with diabetes, or who are already very overweight or have severe breathing problems. A further consideration is that BIMA grafting has a slightly longer operation time (approximately 30 minutes in a three hour procedure) than SIMA grafting. Patients taking part in the study will be asked to complete quality of life questionnaires which may be regarded by some as an inconvenience. Both the SIMA grafting and the BIMA grafting should help treat the patient's coronary heart disease. The possible advantages of BIMA grafting are that there may be a reduced risk of angina, heart attack and a requirement for further intervention, including the possibility of a second CABG operation in the long term. It is not possible to say definitively which type of grafting is better but the information from this study should help to decide the best treatment in the future for patients with coronary heart disease.

Where is the study run from?
Department of Cardiothoracic Surgery, The John Radcliffe (UK)

When is the study starting and how long is it expected to run for?
July 2004 to January 2026

Who is funding the study?
1. British Heart Foundation (UK) up to the 15-year follow up
2. Medical Research Council (UK) up to the 10-year follow up

Who is the main contact?
Professor Marcus Flather
M.Flather@uea.ac.uk

Contact information

Type(s)
Scientific

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Additional identifiers

Protocol serial number
G0200390

Study information

Scientific Title
Arterial Revascularisation Trial - a randomised trial to compare survival following bilateral versus single internal mammary artery (IMA) grafting in coronary revascularisation

Acronym
ART

Study objectives
The main objective is to assess whether the use of both IMA during coronary artery bypass graft (CABG) surgery improves survival and reduces the need for further interventions over that observed with a single IMA.

Ethics approval required
Old ethics approval format

Ethics approval(s)
Current ethics approval as of 26/10/2021:
Approved 09/04/2004, amendment for 15 year follow-up approved 13/12/19, HRA North East-York (NHSBT, Newcastle Blood Donor Centre, Holland Drive, HRA Jarrow, NE2 4NQ; +44 (0)207 104 8079; nrescommittee.northeast-york@nhs.net), ref: 04/3/006

Previous ethics approval:
HRA North East-York, 09/04/2004, ref: 04/3/006

Primary study design
Interventional

Study design
Randomised controlled trial

Study type(s)
Treatment

Health condition(s) or problem(s) studied
Cardiovascular

Interventions
Current interventions as of 26/10/2021:
Patients were randomised to single internal mammary artery (SIMA) grafting or bilateral internal mammary artery (BIMA) grafting with supplemental vein or radial artery grafts as required. Patients will be followed-up for up to 15 years.

Previous interventions:
Patients will be randomised to single internal mammary artery (SIMA) grafting or bilateral internal mammary artery (BIMA) grafting with supplemental vein or radial artery grafts as required.

Intervention Type

Procedure/Surgery

Primary outcome(s)
Current primary outcome measure as of 26/10/2021:
Survival will be measured using patient telephone follow-up or by national databases where applicable at 10 and 15 years.

Previous primary outcome measure:
Survival

Key secondary outcome(s)
Current secondary outcome measures as of 26/10/2021:
1. Cause-specific mortality measured using patient telephone follow-up or by national databases where applicable at 10 and 15 years
2. Major Adverse Cardiovascular Events measured using patient telephone follow-up or by national databases where applicable at 15 years
3. 30 day mortality measured using patient telephone follow-up or by national databases where applicable at 30 days
4. Need for re-intervention by percutaneous coronary intervention or redo surgery other clinical events measured using patient telephone follow-up or by national databases where applicable at 10 years
5. Quality of life measured using the Short Form-36 (SF36), Rose, and EuroQol questionnaires at 10 years
6. Cost-effectiveness measured using patient telephone follow-up or by national databases where applicable at 10 years and (added 24/02/2026) 15 years

Previous secondary outcome measures:
1. Cause-specific mortality
2. 30 day mortality
3. Need for re-intervention by percutaneous coronary intervention or redo surgery
other clinical events
4. Quality of life (SF36, Rose and EuroQol)
5. Cost-effectiveness

Completion date
31/01/2026

Eligibility

Key inclusion criteria
Coronary artery bypass graft (CABG) patients with multi-vessel coronary artery disease (including urgent and off pump CABG patients)

Participant type(s)
Patient

Healthy volunteers allowed
No

Age group
Adult

Sex
All

Total final enrolment
3102

Key exclusion criteria
1. Single graft
2. Redo CABG
3. Evolving myocardial infarction
4. Concomitant valve surgery

Date of first enrolment
01/07/2004

Date of final enrolment
20/12/2007

Locations

Countries of recruitment
United Kingdom

England

Australia

Austria

Brazil

India

Italy

Poland

Study participating centre
Department of Cardiothoracic Surgery, The John Radcliffe
Headley Way
Headington
Oxford
England
OX3 9DU

Sponsor information

Organisation
University of Oxford (UK)

ROR
https://ror.org/052gg0110

Funder(s)

Funder type
Government

Funder Name
British Heart Foundation (SP/03/001)

Alternative Name(s)
The British Heart Foundation, the_bhf, BHF

Funding Body Type
Private sector organisation

Funding Body Subtype
Trusts, charities, foundations (both public and private)

Location
United Kingdom

Funder Name
Medical Research Council (G0200390)

Alternative Name(s)
Medical Research Council (United Kingdom), UK Medical Research Council, Medical Research Committee and Advisory Council, MRC

Funding Body Type
Government organisation

Funding Body Subtype
National government

Location
United Kingdom

Results and Publications

Individual participant data (IPD) sharing plan

Requests relating to the study should be made to Professor Marcus Flather (M.Flather@uea.ac.uk) on behalf of the ART Trial Management Group.

IPD sharing plan summary

Available on request

Study outputs

Output type	Details	Date created	Date added	Peer reviewed?	Patient-facing?
Results article		01/10/2010		Yes	No
Results article		01/06/2015		Yes	No
Results article		01/07/2016		Yes	No
Results article		29/12/2016		Yes	No
Results article		01/08/2017		Yes	No
Results article		01/11/2017		Yes	No
Results article		03/03/2018		Yes	No
Results article		31/01/2019		Yes	No
Results article		01/08/2019	11/06/2020	Yes	No
Protocol article		30/03/2006		Yes	No
Other publications	Assessment of data quality	26/09/2011		Yes	No
Other publications	Secondary analysis	02/09/2026	03/09/2026	Yes	No
Study website		11/11/2025	11/11/2025	No	Yes