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The effects of neo-adjuvant hyperoxic hyperbaric preconditioning on myocardial protection & ischaemic reperfusion injury

Submission date
30/09/2005

Recruitment status
No longer recruiting

Registration date
30/09/2005

Overall study status
Completed

Last Edited
08/04/2016

Condition category
Surgery

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

Plain English summary of protocol

Background and study aims
A coronary artery bypass graft (CABG) is a surgical procedure to treat coronary heart disease. During the procedure, the patient's blood may be re-routed to a heart-lung bypass machine (cardiopulmonary bypass [CPB]). CABG involves periods when the blood supply to the heart tissue is interrupted (ischaemia) and then returns (reperfusion), which may injure the heart tissue (ischemic reperfusion injury). High pressure (hyperbaric) oxygen treatment has been found to reduce heart injury and improve heart function after a heart attack. The aim of this study is to determine whether preconditioning coronary heart disease patients with hyperbaric oxygen before they undergo CPB CABG surgery leads to improved heart function after the operation. We will also assess the safety of hyperbaric oxygen preconditioning, its effects on heart injury, and how long patients need to stay in the intensive care unit (ICU) after the operation.

Who can participate?
Patients undergoing first-time elective CPB CABG surgery

What does the study involve?
Participants are randomly allocated to either be treated with hyperbaric oxygen or not. Treatment with hyperbaric oxygen was completed about 2 hours before the operation. Blood and heart tissue samples (biopsies) are collected during the operation to assess heart injury and the degree of heart protection provided by the hyperbaric oxygen preconditioning. We also record any adverse events and the number of days patients spend in the ICU after the operation.

What are the possible benefits and risks of participating?
Possible benefits of participation include reduced complications after CABG surgery. Risks of participation include complications from treatment with hyperbaric oxygen such as earache, nausea and vomiting.

Where is the study run from?
Castle Hill Hospital (UK)

When is the study starting and how long is it expected to run for?
August 2004 to June 2006

Who is funding the study?
The North and South Bank Research and Development Consortium (UK), NHS R&D Support Funding

Who is the main contact?
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Contact information

Type(s)
Scientific

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Additional identifiers

Protocol serial number
N0084151415

Study information

Scientific Title
The effects of neo-adjuvant hyperoxic hyperbaric preconditioning on myocardial protection & ischaemic reperfusion injury

Study objectives
Does treatment with high pressure (hyperbaric) oxygen (hyperbaric preconditioning), as opposed to short intraoperative episodes of no flow of blood followed by flow of blood to the heart (ischemic preconditioning), provide effective protection to the heart against the phenomenon of ischemic reperfusion injury (injury that occurs to tissues that experience a flow of blood following a prolonged period of no flow of blood) that is known to occur after on-pump and off pump coronary artery bypass surgery?

Ethics approval required

Old ethics approval format

Ethics approval(s)
Not provided at time of registration

Study design
Prospective double-blind randomised controlled trial

Primary study design
Interventional

Study type(s)
Treatment

Health condition(s) or problem(s) studied
Surgery: Coronary artery bypass grafting (CABG)

Interventions
Patients will be recruited from the cohort of the 4 surgeons at the Cardiothoracic Unit in Castle Hill Hospital. Patients will be recruited at the Out-Patients Clinic and on the ward prior to surgery following explanation of the study to the patient and informed consent being obtained.

In order to prevent patients from comparing treatment modalities among themselves and causing patient-induced bias, the patient will not be aware if he/she is to receive ischemic preconditioning. The surgeon and the investigator will be aware of who is to receive ischemic preconditioning prior to surgery.

The patient, the surgeon and the investigator will not be aware of who is to receive hyperbaric oxygen preconditioning or normal atmospheric air prior to surgery. This double blinding is done to further reduce the study bias.

Randomisation will be done in groups of patients. Patients will initially be randomised as a group as to whether they receive ischemic preconditioning or not. After a group of patients have been randomised to either ischemic preconditioning or not, that group will be further randomised as to whether they receive pre-operative hyperbaric oxygen or atmospheric air in a hyperbaric chamber.

The 128 patients will be divided into 2 groups, 64 in each group ie. Group A (64 patients) and Group B (64 patients). Group A (64 patients) will consist of patients undergoing on-pump coronary artery bypass graft surgery. Group B (64 patients) will consist of patients undergoing off-pump coronary artery bypass graft surgery.
The surgeon will determine if the patients has coronary artery bypass graft surgery on-pump or off-pump.

Each of the 64 patients in Group A and Group B, will randomly be further divided into 2 separate groups of 32 patients each ie. Group A1 (32 patients), Group A2 (32 patients), Group B1 (32 patients) and Group B2 (32 patients). The 32 patients in Group A1 and B1 will be treated with ischemic preconditioning while the 32 patients in group A2 and B2 will not be treated with ischemic preconditioning.

Each of the 32 patients in Group A1, A2, B1 and B2 will randomly be further divided into 2 separate groups of 16 patients each ie. Group A1Omega (16 patients), Group A1Teta (16 patients), Group A2Omega (16 patients), Group A2Teta (16 patients), Group B1Omega (16 patients), Group B1Teta (16 patients), Group B2Omega (16 patients) and Group B1Teta (16 patients). Each of the 16 patients in the Omega groups will receive hyperbaric oxygen preconditioning while each of the 16 patients in the Teta groups will not receive hyperbaric oxygen preconditioning (ie. they will receive atmospheric air in a hyperbaric chamber).

Therefore, there will be 8 subgroups. Group A1Omega (16 patients) will receive hyperbaric preconditioning and ischemic preconditioning and operated on-pump. Group A1Teta (16 patients) will not receive hyperbaric preconditioning but will receive ischemic preconditioning and will be operated on-pump. Group A2Omega (16 patients) will receive hyperbaric preconditioning but will not receive ischemic preconditioning and will be operated on-pump. Group A2Teta (16 patients) will not receive hyperbaric preconditioning or ischemic preconditioning and will be operated on-pump. Group B1Omega (16 patients) will receive hyperbaric preconditioning and ischemic preconditioning and will be operated off-pump. Group B1Teta (16 patients) will not receive hyperbaric preconditioning but will receive ischemic preconditioning and will be operated off-pump. Group B2Omega (16 patients) will receive hyperbaric preconditioning but will not receive ischemic preconditioning and will be operated off-pump. Group B2Teta (16 patients) will not receive hyperbaric preconditioning or ischemic preconditioning and will be operated off-pump.

Intervention Type
Procedure/Surgery

Phase
Not Specified

Primary outcome(s)
Demonstration of anticipated enhanced protective effect of hyperbaric preconditioning in the heart biopsies as determined by
1. Elevated levels of cellular HSP 72 mRNA, HSP 72 protein
2. Elevated levels of cellular iNOS mRNA, iNOS protein, eNOS mRNA, eNOS protein and total cellular Nitric Oxide
3. Reduced ischemic reperfusion injury as determined by reduced levels of P-selectin, TNF-ALPHA, IL-6 and IL-8 and its mRNA ie. P-selectin mRNA, TNF-ALPHA mRNA, IL-6 mRNA and IL-8 mRNA

Key secondary outcome(s))
Not provided at time of registration

Completion date
08/06/2006

Eligibility

Key inclusion criteria
Patients will be recruited from the cohort of the 4 surgeons at the Cardiothoracic Unit in Castle Hill Hospital.

Participant type(s)

Patient

Healthy volunteers allowed
No

Age group
Not Specified

Sex
Not Specified

Key exclusion criteria
1. Asthma
2. Known intolerance to N acetyl cysteine
3. Serum creatinine greater than 200 mol/L

Date of first enrolment
31/08/2004

Date of final enrolment
08/06/2006

Locations

Countries of recruitment
United Kingdom

England

Study participating centre
Castle Hill Hospital
Hull
United Kingdom
HU16 5JQ

Sponsor information

Organisation
Department of Health

Funder(s)

Funder type

Government

Funder Name
The North and South Bank Research and Development Consortium (UK), NHS R&D Support Funding

Results and Publications

Individual participant data (IPD) sharing plan

IPD sharing plan summary
Not provided at time of registration

Study outputs

Output type	Details	Date created	Date added	Peer reviewed?	Patient-facing?
Results article	results	01/01/2010		Yes	No
Participant information sheet	Participant information sheet	11/11/2025	11/11/2025	No	Yes