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Myocardial work in severe aortic stenosis

Submission date
17/11/2022

Recruitment status
No longer recruiting

Registration date
12/12/2022

Overall study status
Ongoing

Last Edited
06/11/2024

Condition category
Circulatory System

[ ] Prospectively registered
[ ] Protocol
[ ] Statistical analysis plan
[ ] Results
[ ] Individual participant data
[ ] Record updated in last year

Plain English summary of protocol

Background and study aims
Aortic stenosis (AS) is a debilitating, degenerative form of valve disease whereby the aortic valve (AV) becomes thickened and restricted over time. As the aortic valve leaflets do not open sufficiently in people with AS, there is a risk of developing heart failure and premature death due to the stress experienced within the main pumping chamber of the left ventricle (LV).

AS is the most common type of valvular heart disease in the western world and more prevalent in the elderly population where one in eight people over the age of 75 years have moderate or severe AS. Patients who have significant AS have a considerably reduced quality of life due to symptoms such as breathlessness, chest pain and fatigue. Transthoracic echocardiography (TTE) is a non-invasive ultrasound imaging test, regarded as the gold standard technique for assessing the severity of AS by measuring the speed of blood through the narrowed aortic valve. Another benefit of using TTE is the ability to visualise and assess the function of the LV which is directly connected to the AV. Optimal timing for replacing the AV with a prosthetic alternative is important as those who develop symptoms associated with a restrictive AV are at higher risk of developing long-term complications such as early death following the procedure. While we can assess LV function using a parameter known as ejection fraction (EF) derived by TTE, there are inherent limitations using this method including it not being a particularly sensitive measurement to subtle changes in heart function and problems in accuracy and reproducibility when repeating measurements.

Myocardial Work (MW) is a new parameter which has recently been developed within TTE. This new technique has been identified to be a more sensitive measurement of assessing LV function by dividing the LV into segments and evaluating how well the heart contracts and combining this information with resting blood pressure. MW allows for a more detailed and sensitive look at how the heart is responding to the increased demands caused by AS by the formation of pressure-strain loops of each segment heart muscle. However, there are no current studies that evaluate whether MW before AV replacement can predict short and long-term outcomes. Therefore, this study intends on evaluating MW in severe AS patients prior to their already scheduled transcatheter aortic valve intervention (TAVI) and determine if this new measurement predicts re-hospitalisation for heart failure and survival. The aims of the study are to determine if MW is a better predictor of outcomes compared to current measurements such as EF and

myocardial strain. Secondary outcomes are to establish if the percentage change in MW following valve replacement predicts outcomes and whether changes in blood pressure measurement related to patient position significantly alter MW results.

Who can participate?
Adult patients with severe AS

What does the study involve?
MW will be evaluated in severe AS patients prior to their already scheduled TAVI. A TTE will also be performed following the implantation of the new prosthetic valve prior to hospital discharge to repeat MW measurements and provide details of any complications that have arisen during the procedure. This TTE will provide all the standardised measurements performed by staff within the hospital and therefore will reduce the burden in the department. These patients will also receive an echocardiogram at 6 weeks and 12 months post-TAVI to look at the change in MW as a part of their standard follow-up. The same patients will also be followed-up after hospital discharge at regular intervals every six months via telephone appointment or email to enquire about any hospital readmissions or death for three years.

What are the possible benefits and risks of participating?
As this is a non-invasive, observational study using echocardiography. The possible benefits are to future patients with severe AS to determine if MW is a more sensitive marker of outcomes compared to current methods used in clinical practice. There are no risks to patients being involved in the study.

Where is the study run from?
Newcastle Hospitals Trust, which is a large tertiary TAVI centre, as a part of a PhD project (UK)

When is the study starting and how long is it expected to run for?
November 2022 to November 2027

Who is funding the study?
The PhD is funded by Newcastle University (UK) in collaboration with Newcastle upon Tyne Hospitals NHS Foundation Trust (UK)

Who is the main contact?
Peter Luke, peter.luke@newcastle.ac.uk (UK)

Contact information

Type(s)
Principal investigator

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Scientific

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Additional identifiers

Integrated Research Application System (IRAS)
313577

Study information

Scientific Title
Can the use of echocardiographic derived myocardial work predict outcomes in patients with severe aortic stenosis prior to transcatheter aortic valve intervention

Study objectives
Does Myocardial work, an echocardiography-based diagnostic tool, better predict survival, and major adverse clinical endpoints (myocardial infarction, stroke, re-hospitalisation for heart failure) compared to existing methods observed in echocardiography such as ejection fraction and myocardial deformation imaging?

Ethics approval required
Old ethics approval format

Ethics approval(s)
Approved 07/11/2022, Health Research Authority London – Chelsea (London Centre, 2 Redman Place, HRA, E20 1JQ, UK; +44 (0)207 104 8029; chelsea.rec@hra.nhs.uk), ref: 22/LO/0675

Primary study design
Observational

Study design
Observational investigation study

Study type(s)
Diagnostic

Health condition(s) or problem(s) studied
Severe aortic stenosis prior to transcatheter aortic valve intervention

Interventions
A standard transthoracic echocardiogram and non-invasive blood pressure will be performed prior to transcatheter aortic valve intervention (TAVI) to assess myocardial work. This is a non-randomised, single-centre, observational trial following up patients with severe aortic stenosis post-TAVI for 3 years using echocardiography to measure myocardial work. Each patient recruited into the study will be followed up at 6-month intervals for 3 years by their preferred contact details (email, post or telephone) and have a transthoracic echocardiogram prior to TAVI, post-TAVI, 6 weeks and 1-year post-TAVI (4 echocardiograms in total for each participant). For those who have a different valve, their myocardial work will be compared to see if there is a statistically significant difference in myocardial work and whether this influenced outcomes at 3 years. Changes in blood pressure in the sitting and the left lateral decubitus position due to change will be directly compared for each participant to determine if myocardial work significantly changes with patient positioning.

Intervention Type
Procedure/Surgery

Primary outcome(s)
1. Myocardial work measured using echocardiography assessed immediately before transcatheter aortic valve intervention (TAVI), immediately post-TAVI, and at 6 weeks and 12 months post-procedure.
2. Survival and incidence of major adverse clinical endpoints measured by contacting patients by telephone, post or email at 6 monthly intervals up to 3 years, and by echocardiograms performed at 6 weeks and 12 months. Mortality will be reviewed by assessing patient medical records prior to contacting patients at six-month intervals.

Key secondary outcome(s)
1. Myocardial work results in seated and supine patients measured using non-invasive blood pressure and echocardiography prior to and post TAVI (before hospital discharge), 6 weeks and 12 months post-TAVI
2. Post-procedure Myocardial work results in patients with differing valve types measured using echocardiography. Evaluating percentage change in myocardial work in severe aortic stenosis patients before the valve implantation and compare to myocardial work following the TAVI using echocardiography to see if percentage change predicts mortality and hospitalisation at end of study follow-up at 3 years.

Completion date
01/11/2027

Eligibility

Key inclusion criteria
1. Severe aortic stenosis with a peak velocity (>4.0m/s), mean gradient (>40mmHg) and an aortic valve area <1.0cm on transthoracic echocardiography requiring a transcatheter aortic valve intervention.
2. Patients with low-flow aortic stenosis (peak gradient <4.0m/s with AVA <1.0cm2) who require a TAVI will also be invited to participate

Participant type(s)
Patient

Healthy volunteers allowed
No

Age group
Adult

Lower age limit
18 Years

Sex
All

Total final enrolment
104

Key exclusion criteria
1. Age under 18 years old
2. Mild or moderate aortic stenosis (<4.0m/s), mean gradient (<40mmHg), and aortic valve area >1.0cm
3. Suboptimal image quality which does not allow for quantitative left ventricular function assessment by Biplane Simpson, myocardial deformation imaging and myocardial work
4. Poorly controlled arrhythmias or more than moderate mitral regurgitation
5. Unable to tolerate a transthoracic echocardiogram
6. Do not provide consent

Date of first enrolment
30/11/2022

Date of final enrolment
30/11/2024

Locations

Countries of recruitment
United Kingdom

England

Study participating centre
The Newcastle upon Tyne Hospitals NHS Foundation Trust
Freeman Hospital
Freeman Road
High Heaton
Newcastle upon Tyne
United Kingdom
NE7 7DN

Sponsor information

Organisation
Newcastle upon Tyne Hospitals NHS Foundation Trust

ROR
https://ror.org/05p40t847

Funder(s)

Funder type
University/education

Funder Name
Newcastle University

Alternative Name(s)

Funding Body Type
Private sector organisation

Funding Body Subtype
Universities (academic only)

Location
United Kingdom

Funder Name
Newcastle upon Tyne Hospitals NHS Foundation Trust

Alternative Name(s)

Newcastle upon Tyne Hospitals NHS Trust

Funding Body Type
Government organisation

Funding Body Subtype
Local government

Location
United Kingdom

Results and Publications

Individual participant data (IPD) sharing plan
The datasets generated during and/or analysed during the current study are/will be available upon request from Peter Luke - peter.luke@nhs.net, the type of data that will be shared is Individual participant data that underlie the results reported in this article, made available immediately following publication with no end date, to researchers who provide a detailed methodically sound proposal in order to achieve the aims in the approved proposal. The data will be available following a data access agreement. All data will be completely anonymised.

IPD sharing plan summary
Available on request

Study outputs

Output type	Details	Date created	Date added	Peer reviewed?	Patient-facing?
HRA research summary			28/06/2023	No	No
Participant information sheet	version 3.0	18/10/2022	29/11/2022	No	Yes