UCL INSTITUTE OF CARDIOVASCULAR SCIENCE

List of Research Projects:

iBSc in Cardiovascular Science – CARD3002

Academic year 2018-19

V.2
21/09/2018

Research Project ID01

Mitochondrial and Genomic DNA as novel mediators of cardiovascular injury

Supervisor(s): Dr Robert Bell, Prof Derek Yellon

Email(s): rob.bell@ucl.ac.uk; d.yellon@ucl.ac.uk

Department/Group: ICS The Hatter Cardiovascular Institute, UCL

Project outline:

Research Project ID02

Novel means of cardioprotection by exploiting pathways activated E\ 6WURP DO' HULYHG)DFWRU .

Supervisor(s): Dr Sean Davidson, Prof Derek Yellon

Email(s): s.davidson@ucl.ac.uk; d.yellon@ucl.ac.uk

Department/Group: The Hatter Cardiovascular Institute, UCL

Project outline:

Heart attacks cause the death of cardiomyocytes. Stromal Derived Factor-1a (SDF-1 D) can protect cardiomyocytes from death but its precise mechanism of action is not known.

There are two receptors for SDF-1 DCXCR4 and CXCR7. There is increasing interest in CXCR7 due to its emerging role in revascularization and regeneration. This project involves the generation of novel mice with inducible, endothelial-specific deletion of CXCR7 to investigate its role in cardioprotection. We will also use a unique antibody to SDF-1 that we developed to investigate its role before and after ischaemic injury. The ultimate aim is to

Research Project ID03

Prevent today’s cancer survivor from becoming tomorrow’s cardiac patient.

Supervisor(s):

Research Project ID04

Protecting the heart in the setting of diabetes

Supervisor(s): Dr Rob Bell, Dr Sapna Arjun, Prof Derek Yellon

Email(s): rob.bell@ucl.ac.uk; s.subrayan@ucl.ac.uk; d.yellon@ucl.ac.uk

Research Project ID05

Exosomes – endogenous nanoparticles that protect the heart

Supervisor(s): Dr Sean Davidson and Prof Derek Yellon

Email(s): s.davidson@ucl.ac.uk; d.yellon@ucl.ac.uk

Department/Group: The Hatter Cardiovascular Institute, UCL

Project outline:

Exosomes are nano-sized lipid membrane vesicles that circulate in the blood at up concentrations of up to 10^9 per ml. Recent high-profile studies that show they can deliver miRNA and proteins between cells. However, we still know very little about what they do. We have shown that plasma exosomes are able to protect the heart against ischaemia and reperfusion injury, such as occurs during a heart attack. This project involves the study of exosomes using technology such as nanoparticle tracking analysis, fluorescent confocal imaging, and Western blot analysis, to investigate exosomes and cardioprotection, with a view to using them as therapeutic agents. Novel, highly purified, clinical relevant exosomes will be used in these studies in collaboration with the stem cell research company ReNeuron.

Key references:

- Vicencio JM, Yellon DM, Sivaraman V, Das D, Boi-Doku C, Arjun S, Zheng Y, Riquelme JA, Kearney J, Sharma V, Multhoff G, Hall AR, Davidson SM Plasma exosomes protect the myocardium from ischemia-reperfusion injury J Am Coll Cardiol 65(2015):1525-36
- Yellon DM, Davidson SM. Exosomes: nanoparticles involved in cardioprotection? Circ Res 114:(2014):325-32
- Hausenloy DJ, Yellon DM. Myocardial ischemia-reperfusion injury: a neglected therapeutic target. J Clin Invest. 2013 Jan;123(1):92-100.
- The therapeutic potential of ischemic conditioning: an update. Hausenloy DJ, Yellon DM. Nat Rev Cardiol. 2011 Jun 21;8(11):619-29
- Davidson SM, Vicencio JM, Riquelme JA, Doreth C, Khoo V, Boi-Doku C, Multhoff G, Yellon DM.Cardioprotection mediated by exosomes is impaired in the setting of type II diabetes but can be rescued by the use of non-diabetic exosomes in vitro. J Cell & Mol Medion S74.3(e)-10.2 0 1 ocon 25.ndi:

Research Project ID06

5HJXODWRQ RI WKH LQIODPPDWRU\ UHVSRQVHE\ 6') . &; &5 DIWHU acute myocardial infarction

Supervisor(s): Prof Derek Yellon & Dr Daniel Bromage

Email(s): d.yellon@ucl.ac.uk; dan.bromage.13@ucl.ac.uk

Department/Group: The Hatter Cardiovascular Institute, UCL

Project outline:

6WURPDOGHULYHG IDFWRU . 6') . &; &/ LV D &; & FKHPRNLQH WKDWLV XS UHJXODWHG LQ experimental and clinical studies of acute myocardial infarction and regulates chemotaxis of inflammatory and progenitor cells to sites of myocardial injury (1). Interestingly, transgenic PLFH ZLWK FDUGLRP\RF\WH VSHFLILF GHOHWLRQ RI WKH FRJQDWH 6') . UHFHSWRU &; &5 &0 CXCR4$^{-/-}$), are protected against ischaemia-reperfusion injury, although the exact mechanism is unknown. It is hypothesised that the cardio-protection in CM-CXCR4$^{-/-}$ transgenic mice is contingent on reduced inflammatory cytokine release, including monocyte chemoattractant SURWHLQ LQWHUOHXNLQ DQG WXPRXU QHFURVLV IDFWRU . 7KH SURMHFW WKHUHIRUH DLP V DUH WR LQYHVWLJDWH WKH LPSRUWDQFH RI 6') . &; &5 P HGLDWHG LQIODPPDWRQ LQ FDUGLR SURWHFWLRQ BHF PhD students will learn a broad range of techniques in this project including include real-time quantitative PCR using mouse inflammatory cytokine and receptor PCR arrays, mouse cardiomyocyte isolation and simulated ischaemia-reperfusion (hypoxia-reoxygenation), and characterisation of the inflammatory phenotype using FACS and immunohistochemistry. In addition the student will learn the isolated perfused mouse heart Langendorff preparation.

Key references:

- %UDPDJH' ' DYLGVRQ60 <HOORQ' 0 6WURPDOGHULYHG IDFWRU . $ FKHPRNLQH WKDWGHOLYHUV DWZR pronged defence of the myocardium Pharmacology & Therapeutics 2014;143: 305–315
- Shi J, Dai W, Kloner RA. Therapeutic Hypothermia Reduces the Inflammatory Response Following Ischemia/Reperfusion Injury in Rat Hearts. Ther Hypothermia Temp Manag. 2017.
- Schiraldi M, Raucci A, Munoz LM, Livoti E, Celona B, Venereau E, et al. HMGB1 promotes recruitment of inflammatory cells to damaged tissues by forming a complex with CXCL12 and signaling via CXCR4.
- J Exp Med. 2012;209(3):551-63.
- Huang XZ, Wu JF, Cass D, Erle DJ, Corry D, Young SG, et al. Inactivation of the integrin beta 6 subunit gene reveals a role of epithelial integrins in regulating inflammation in the lung and skin. J Cell Biol. 1996;133(4):921-8.
- Muhlstedt S, Ghadge SK, Duchene J, Qadri F, Jarve A, Vilianovich L, et al. Cardiomyocyte-derived CXCL12 is not involved in cardiogenesis but plays a crucial role in myocardial infarction. J Mol Med (Berl). 2016;94:1005-14.

Research Project ID07

Neuroprotection by remote ischaemic conditioning in acute ischaemic stroke

Supervisor(s): Prof Derek Yellon & Dr Maryna Basalay

Email(s): d.yellon@ucl.ac.uk marina.basalay@ucl.ac.uk

Department/Group: The Hatter Cardiovascular Institute, UCL

Project outline:

Ischaemic stroke is one of the leading causes of death worldwide. At present, timely restitution of blood flow by intravenous thrombolysis or thrombectomy is the sole existing treatment strategy, which is known to reduce infarct size in these patients. However, this treatment, even if successful, does not ensure full recovery in most of the treated patients. This indicates the need of additional therapeutic methods, alleviating ischaemia and reperfusion damage in the brain. Among such potential methods, the most promising is phenomenon of Remote Ischaemic Conditioning (RIC). RIC is a method whereby the application of brief episodes of ischaemia and reperfusion to an organ/tissue can significantly protect a remote organ (the heart or the brain) from subsequent injury. Initially described as a promising method to protect the heart, RIC is now known to be able to protect all the organs. We have demonstrated the neuroprotective effects of RIC in pilot studies in rats. The aims of this project are therefore; to establish whether the infarct-limiting effect of RIC depends on the duration of focal brain ischaemia; to determine the delay interval at reperfusion, within which RIC is neuroprotective. To investigate the potential mechanisms associated with protection observed following RIC. We shall be using protocols in which infarct size in the brain will be measured, histologically (TTC staining) and with the use of high-resolution magnetic resonance imaging (MRI). This is an ideal PhD project with potential to collaborate we have at the Stroke Unit at the University of Lyon in France.

Key references:

- Hausenloy DJ, Yellon DM. The therapeutic potential of ischemic conditioning: an update. Nat Rev Cardiol. 2011 Jun 21;8(11):619-29
- Basalay M V., Davidson SM, Gourine A V., Yellon DM. Neural mechanisms in remote ischaemic conditioning in the heart and brain: mechanistic and translational aspects. Basic Res Cardiol 2018;113:25.
- Fisher M, Feuerstein G, Howells DW, Hurn PD, Kent TA, Savitz SI, Lo EH, STAIR Group. Update of the stroke therapy academic industry roundtable preclinical recommendations.
- Stroke 2009;40:2244–2250.
- Yellon DM, Hausenloy DJ. Myocardial Reperfusion Injury. New Engl J Med 2007;357:1121–1135.
- Savitz SI, Baron J-C, Yenari MA, Sanossian N, Fisher M. Reconsidering Neuroprotection in the Reperfusion Era. Stroke 2017;48:3413–3419.

Research Project ID08

Using a bioinformatic approach to describe a specific cardiovascular relevant process

Supervisor(s): Ruth Lovering; Rachael Huntley Email(s): r.lovering@ucl.ac.uk

Department/Group: Institute of Cardiovascular Science / Functional Gene Annotation

Project outline:

Bioinformatic resources are an essential tool for modern biologists and clinicians. This project will give you hands on experience of using these tools, understanding their limitations and enable you to confidently find the right resource for your future research. Gene Ontology (GO) is now an established standard for the functional annotation of gene products (www.geneontology.org/).

This project will involve in depth literature review and annotation of speci.6(n)1.6(d)1.62rg/F.6(n(e)1.6(ca)1

Research Project ID14

Measuring reactive hyperemia in the gastrocnemius using near-infrared spectroscopy (NIRS): How important is occlusion duration?

Supervisor(s): Siana JONES **Email:** siana.jones@ucl.ac.uk
Alun HUGHES **Email:** alun.hughes@ucl.ac.uk

Department/Group: ICS- Population Science and Experimental Medicine (PSEM)

Project outline:

Research Project ID16

Statistical shape analysis of the aorta in Marfan population: a longitudinal study

Supervisor(s):	**Email(s):**
Dr Elena Milano	e.milano@ucl.ac.uk
Dr Silvia Schievano	s.schievano@ucl.ac.uk
Dr Elena Cervi	elena.cervi@gosh.nhs.uk
Miss Benedetta Biffi	b.biffi@ucl.ac.uk

Department/Group: ICS Clinical Cardiovascular Engineering Group

Project outline:

Marfan syndrome is a genetic disorder of the connective tissue, causing aortic anomalies such as enlargement and/or aneurysm. Regular monitoring of Marfan patients aortas is essential, in order to detect any morphological change and timely plan surgery, thus lowering the risk of abrupt aortic dissection.

The aim of this project is to perform statistical shape analysis of aortic 3D models derived from magnetic resonance images of a Marfan population. Providing quantitative information on the average aortic shape and time shape variations within the population, such analysis could help improve the understanding of the disease and predict of how it develops over time, ultimately impacting on patients management.

Key references:

Congenital heart disease, medical imaging, population study, image segmentation, statistical shape analysis

Research Project ID20

Population analysis of pulmonary artery from shape modelling perspective.

Supervisor(s): Dr Emilie Sauvage, Dr. Claudio Capelli, Dr Silvia Schievano

Email(s): e.sauvage@ucl.ac.uk; c.capelli@ucl.ac.uk; s.schievano@ucl.ac.uk

Department/Group: Institute of Cardiovascular Science / Clinical Cardiovascular Engineering

Project outline:

In this analysis we perform a comprehensive shape analysis on pulmonary arteries (PA) that are identified as defective that due to various congenital conditions. The shape is often complex and may exhibit stenotic area. We hypothesize that a degenerative PA has a unique phenotype compared to the one in normal subjects and that 3D shape characterization can help improve diagnosis and risk evaluation for the patient.

Current tools are able to describe shape features and identify 3D shape biomarkers from medical imaging (2016_Bruse). Others are capable of simulating blood flow on patient specific geometries subjected to realistic conditions and thus help design the most appropriate treatment. There is strong evidence that such tools provide essential information when selecting the proper treatment for the patient (2010_Capelli, 2010_Schievano).

The aim of this project is to analyse the shape of pulmonary artery from a cohort of 30 to 40 medical image sets. The student will identify outliers, mean geometry and cast the geometry into relevant groups using existing tools based on Principal Component Analysis method. The final stage involves fluid simulation performed on patient geometries in order to extract relevant flow quantities able to support the previous choice of shape casting.

Key references:

- 2010_Capelli: Capelli C, Taylor AM, Migliavacca F, Bonhoeffer P, Schievano S. Patient-specific reconstructed anatomies and computer simulations are fundamental for selecting medical device treatment: application to a new percutaneous pulmonary valve. Philosophical transactions Series A, Mathematical, physical, and engineering sciences. 2010;368(1921):3027-3038.
- 2010_Schievano: Schievano S, Taylor AM, Capelli C, Lurz P, Nordmeyer J, Migliavacca F, Bonhoeffer P. Patient specific finite element analysis results in more accurate prediction of stent fractures: application to percutaneous pulmonary valve implantation. Journal of Biomechanics. 2010; 43(4):687-693
- 2016_Bruse: Bruse J, McLeod K, Biglino G, Ntsinjana HN, Capelli C, Hsia TY, Sermesant M, Pennec X, Taylor AM, Schievano S. A statistical shape modelling framework to extract 3D shape biomarkers from medical imaging data: assessing arch morphology of repaired coarctation of the aorta. BMC Medical ImagingBMC series – open, inclusive and trusted. 2016; **16**:40

Research Project ID25

Functional and phenotypic ‘switching’ in vascular smooth muscle cells

Supervisor(s): Dr Markella Ponticos **Email(s):** m.ponticos@ucl.ac.uk

Department/Group: Inflammation/ Centre for Rheumatology and Connective Tissue diseases

Project outline:

Phenotypic modulation of vascular smooth muscle cells (VSMC) is associated with vascular remodelling in many cardiovascular diseases. Stimuli associated with specific disease processes such as endothelial dysfunction or inflammation initiate pathways that result in the de-differentiation of VSMC towards proliferative, embryonic-like and disease-associated phenotype. Many of these pathways concomitantly affect many cellular functions of VSMC which ultimately result in diseased vessels. The aim of this project is to investigate the pathways that result in the de-differentiation process which also relate to the loss of function of injured/diseased vessels and to identify target genes that activate these processes. We previously generated gene array data comparing healthy and de-differentiated VSMC identifying novel gene targets. Cellular and molecular biological techniques using VSMC in culture, inhibition/ RNA interference of target genes as well as in vitro and ex-vivo assays to assess function (proliferation, migration, contraction, apoptosis) will be utilised. Robust geneand ex-vitc6(e

Research Project ID27

Functional and phenotypic ‘switching’ in vascular smooth muscle cells

Supervisor(s): Dr Markella Ponticos **Email(s):** m.ponticos@ucl.ac.uk

Department/Group: Inflammation/ Centre for Rheumatology and Connective Tissue diseases

Project outline:

Phenotypic modulation of vascular smooth muscle cells (VSMC) is associated with vascular remodelling in many cardiovascular diseases. Stimuli associated with specific disease processes such as endothelial dysfunction or inflammation initiate pathways that result in the de-differentiation of VSMC towards proliferative, embryonic-like and disease-associated

Research Project ID28

Prostate Cancer, Therapies and Cardiovascular risk

Supervisor(s): Riyaz Patel **Email(s):** Riyaz.patel@ucl.ac.uk

Department/Group: ICS, Farr Institute

Project outline:
There is uncertainty about the role of prostate cancer therapies and risk of cardiovascular disease (CVD). Some treatments like GnRH agonists are cheap and widely used but may cause cardiovascular disease. This work will develop evidence around testosterone

Research Project ID31

Prevalence of traditional cardiovascular risk factors among young patients with coronary artery disease

Supervisor(s): Dr Riyaz Patel; Dr Leon Menezes **Email(s):** Riyaz.patel@ucl.ac.uk

Department/Group: ICS-UCL, Barts Heart Centre

Project outline:

Research Project ID32

Research Project ID33

Characterisation of paediatric hypertrophic cardiomyopathy caused by MYH7 mutations

Supervisor(s):
Dr Juan Pablo Kask, Ms Ella Field

Email(s):
j.kaski@ucl.ac.uk

Department/Group: Inherited Cardiovascular Diseases, Great Ormond Street Hospital

Project outline:

Most cases of HCM in childhood are caused by mutations in the sarcomere protein genes, inherited as autosomal dominant traits with age-related penetrance. MYH7 gene variants are among the two most common causes of sarcomeric disease. Disease onset is usually seen in late adolescence to early adulthood, and the clinical presentation and prognosis of childhood-onset disease is not well described. This retrospective cohort study will investigate the clinical features and outcomes of childhood-onset HCM caused by MYH7 gene variants.

Key references:

- Kaski JP, Syrris P, Esteban MT et al. Prevalence of sarcomere protein gene mutations in preadolescent children with hypertrophic cardiomyopathy. Circ Cardiovasc Genet. 2009 Oct;2(5):436-41
- Moak JP, Kaski JP. Hypertrophic cardiomyopathy in children. Heart. 2012 Jul;98(14):1044-54
- Morita H, Rehm HL, Menesses A et al. Shared genetic causes of cardiac hypertrophy in children and adults. N Engl J Med. 2008 May 1;358(18):1899-908

Research Project ID38

Studying facets of inflammation in pulmonary arterial hypertension

Supervisor(s):

Research Project ID49

Ethnic differences in atherosclerosis in relation to cardiovascular risk

Supervisors: Alun Hughes, Sophie Eastwood, Nish Chaturvedi
Email(s): a.hughes@ucl.ac.uk

Project outline:
People of different ethnicities living in the UK experience different risks of coronary heart disease (CHD) and stroke. Compared with Europeans, people of South Asian ethnicity have a markedly increased risk of CHD and stroke, whereas people of African-Caribbean ethnicity have a lower risk of CHD, but an elevated risk of stroke.[1] These ethnic differences not understood, but differential atherosclerotic plaque vulnerability due to differences in plaque composition is a possible explanation.

Research Project ID50

Investigating the role of nedd9 in zebrafish models of angiogenesis.

Research Project ID51

Cardiac manifestations in congenital myotonic distrophy

Supervisor(s): **Elena Cervi** **Email(s): elena.cervi@nhs.net**

Department/Group: Cardiology at Great Ormond Street Hospital

Project outline:

Cardiac involvement in myotonic dystrophy especially with cardiac conduction disease and ventricular tachycardias with associated risk of sudden death is a well-established manifestation in adult cardiac practice. Less is known about cardiac manifestations in infancy in children affected with the most severe form of the neuromuscular condition, congenital myotonic dystrophy. We have recently established a pathway of care with the neuromuscular team and we will review our collected data to assess their manifestations and stratify their risk.

Key references:

- Myotonic Dystrophy And The Heart. G Pelargonio, A Dello Russo, T Sanna, G De Martino, F Bellocci. Heart 2002;88:665–670
- Severe cardiac arrhythmias in young patients with myotonic dystrophy type 1. G. Bassez, MD; A. Lazarus, MD; I. Desguerre, MD; J. Varin, MD; P. Laforêt, MD; H.M. Bécane, MD; C. Meune, MD; M.C. Arne-Bes, MD; Z. Ounnoughene, MD; H. Radvanyi, MD, PhD; B. Eymard, MD, PhD; and D. Duboc, MD, PhD. Neurology 2004;63 1939-41.
- Cardiac Abnormalities in Congenital and Childhood Myotonic Muscular Dystrophy Type 1. Anjali Sharma Sandeep Singh Shri K. Mishra. Neuropediatrics 2017;48:42–44.

Research Project ID53

Long-term cardiovascular outcomes in patients with mitochondrial diseases

Supervisor(s): Dr Konstantinos Savvatis **Email(s):** k.savvatis@nhs.net

Department/Group: Inherited Cardiovascular Diseases, Barts Heart Centre and UCL Institute of Cardiovascular Science

Project outline:

Mitochondrial diseases are systemic diseases secondary to defects in the structure or function of mitochondria, which are responsible for energy production in the organism. Mitochondria are under the dual control of nuclear and mitochondrial DNA. Mitochondrial diseases present with wide range of clinical expression with involvement of the nervous system and skeletal muscles being common. Cardiac disease can occur and can range from asymptomatic changes to severe cardiomyopathy.[1, 2] [3]The purpose of this project is the description of the natural history and clinical outcomes in patients with genetically confirmed mitochondrial

Research Project ID54

MSc Cardiovascular Science project: The association between sleep quality and risk of CVD: A tri-ethnic study using data from the Southall and Brent REvisited Study (SABRE)

Supervisor: Dr Victoria Garfield
Email: v.garfield@ucl.ac.uk

Project outline:

The association between sleep duration and CVD is well established, whilst the relationship between sleep quality and risk of CVD is less well understood and whether there are ethnic differences remains to be determined. We have sleep quality data collected in the Southall and Brent REvisited Study (SABRE) at baseline (1988) and follow-up data for participants up to 30 years later. This epidemiological study aims to primarily, investigate the association between sleep quality and risk of cardiovascular disease (CVD) in a UK community sample and as a secondary aim, examine whether this differs by ethnicity in adults of Europeans, South Asians and African Caribbeans. This project would suit a student who would be keen to gain experience in statistical modelling and has an interest in the analysis of prospective epidemiological studies.

Research Project ID56

Tissue characterization with MRI in paediatric hypertrophic cardiomyopathy #2

Supervisor(s): Vivek Muthurangu **Email(s):** v.muthurangu@ucl.ac.uk
Department/Group: Translational Cardiovascular Imaging

Project outline:

Great Ormond Street hospital has the largest paediatric population of patients with hypertrophic cardiomyopathy (HCM). We have pioneered the use of cardiac MRI for assessment of these children and have one of largest phentotyped populations in the world. Conventionally, HCM is diagnosed by increased left ventricular wall thickness and this has been shown to predict outcome. However, it is known that HCM causes inflammation and scarring in the myocardium. MRI is the best non-invasive method of assessing tissue

Research Project ID57

The prognostic utility of MRI in paediatric pulmonary hypertension

Supervisor(s):Vivek Muthurangu **Email(s): v.muthurangu@ucl.ac.uk**

Research Project ID68

Prediction of number of replicates required to enhance the reliability of three-dimensional speckle tracing echocardiography.

Supervisors: Alun Hughes **Email:** alun.hughes@ucl.ac.uk
Lamia Al Saikhan **Email:** lamia.saikhan.16@ucl.ac.uk

Department/Group: Population Science & Experimental Medicine

Project outline:

Three-dimensional (3D) speckle tracking echocardiography (3D-STE) is a novel advanced imaging technique used to analyse left ventricular (LV) myocardial deformation from acquired LV full-volume data sets. Theoretically, 3D-STE is believed to overcome some of the limitations of two-dimensional STE (2D-STE) providing a comprehensive quantification of advanced LV myocardial mechanics from a single 3D data set. This includes LV strain (longitudinal and circumferential shortening and radial lengthening in addition to the new 3D strain, a composite measure of longitudinal and circumferential strain; LV twist and rotations; LV mechanical dyssynchrony; and LV volumes. However, the reliability of 3DSTE LV derived measures varies. For example, twist has modest reliability being highly vulnerable to variability as opposed to other measure such as volumes. Reliability also varies between different LV strain measures. Reliability is often assessed by intra-class correlation coefficient (ICC). Spearman-Brown formula is a formal which can be used to predict the number of replicates required to achieve a desired degree of reliability. This project aims to test whether applying this formula is useful in enhancing the overall reliability of 3D-STE LV derived measures. This will be achieved by comparing the predicted ICC for ‘x’ replicates estimated from ICC of a single replicate and the actual averaged ICC estimated from actual ‘x’ replicates of measurements. It is hoped that this study will give insights of the usefulness of implementing the Spearman-Brown formula in the medical imaging field.

Key references:

1. Muraru D, et al. Three-dimensional speckle-tracking echocardiography: benefits and limitations of integrati3.6(-)4.6(Vse)12.6(t)-JETQqB87.3(t)

Research Project ID69

The impact of using different software versions in assessing left ventricular volumes, strain, torsion and dyssynchrony by three-dimensional speckle tracking echocardiography.

Supervisors: Alun Hughes **Email:** alun.hughes@ucl.ac.uk
Lamia Al Saikhan **Email:** lamia.saikhan.16@ucl.ac.uk

Department/Group: Population Science & Experimental Medicine

Project outline:

Three-dimensional (3D) speckle tracking echocardiography (3D-STE) is a novel advanced imaging technique used to analyse left ventricular (LV) myocardial deformation from acquired LV full-volume data sets. 3D-STE provides a comprehensive quantification of LV geometry and function including complex LV myocardial mechanics from a single 3D data set. This includes LV strain (longitudinal and circumferential shortening and radial lengthening in addition to the new 3D strain, a composite measure of longitudinal and circumferential strain; LV twist and torsion; LV mechanical dyssynchrony; and LV volumetric measures. While the reproducibility both intra- and inter-observer of 3D-STE is generally acceptable to good, this technology suffers from inter-vendor variability and standardization between different vendors is needed. However, little is known regarding the impact of using different software versions of the same manufacturer in 3D-STE derived LV measures. This project aims to use two different versions of vendor independent software to analyse LV full-volume 3D data sets.

Key references:

1. Muraru D, Niero A, Rodriguez-Zanella H, Cherata D, Badano L. Three-dimensional speckle-tracking echocardiography: benefits and limitations of integrating myocardial mechanics with three-dimensional imaging. Cardiovascular diagnosis and therapy. 2018;8(1):101-17.
2. Gayat E, Ahmad H, Weinert L, Lang RM, Mor-Avi V. Reproducibility and inter-vendor variability of left ventricular deformation measurements by three-nilitysional spWrlity of