

SSRCTS



SCANDINAVIAN SOCIETY FOR RESEARCH IN
CARDIOTHORACIC SURGERY

29th Annual Meeting

Program & Abstracts

February 7 - 9, 2019

THURSDAY

February 7, 2019

14.00

Arrival and registration

14.45

Welcome to SSRCTS
Vibeke Hjortdal

15.00

The feedback concept
Zarmiga Karunanithi

15.10

Oral Session 1

16.10

Coffee Break

16.25

Poster Session 1

16.45

Invited lecture
Anders Ahlsson

17.15

Coffee Break

17.30

Oral Session 2

18.10

Coffee Break

18.25

Invited lecture
Jens Erik Nielsen-Kudsk

18.55

Break

20.00

Dinner

FRIDAY

February 8, 2019

14.00

Gudbjartsson Award I

14.45

Invited lecture
Eeva Moilanen

15.15

Coffee Break

15.30

Gudbjartsson Award II

16.00

Invited lecture
Malakh Shrestha

16.30

Invited lecture
Alexander Wahba

17.00

Wet Lab

19.30

Break

20.00

Dinner with hosts

SATURDAY

February 9, 2019

14.00

Oral Session 3

14.45

Invited lecture
Ignacio Lugones

15.15

Coffee Break

15.30

Invited lecture
Ingvar Berg

16.00

Poster Session 2

16.20

Invited lecture
Tomas Gudbjartsson

16.50

Coffee Break &
Award-committee meeting

17.30

Awards

18.00

Evaluation
Beer & Business

18.30

Entertainment

19.15

Break - Dress to impress!

20.00

Presidential Dinner
with pompous speeches



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WELCOME!

Dear colleagues and friends,

The organising committee welcomes you to the 29th Annual Scientific Meeting of The Scandinavian Society for Research in Cardiothoracic Surgery (SSRCTS) taking place from February 7 to 9, 2019 at Hotel Bardøla in Geilo, Norway.

At this meeting, you have the opportunity to meet and learn from experts, be updated on research within the field, and train your surgical skills in our Wet Lab. The conference program features lectures held by international experts from Germany, Argentina and Scandinavia. In addition to invited lectures, the program offers 15 oral and 6 poster presentations.

As is our tradition, we focus on giving young scientists knowledge and skills to better themselves. As we nurture our future, young scientists will co-chair sessions with experienced scientists. Furthermore, a young scientist will be appointed discussant for each of the Award papers posing questions, before the paper is open for discussion by the audience.

On behalf of the organising committee, we welcome you all to SSRCTS 2019!

Vibeke E. Hjortdal
President of SSRCTS





COMMITTEE

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SCIENTIFIC PROGRAM

THURSDAY, FEBRUARY 7

- 14.00 - 14.45 Arrival and registration
- 14.45 - 15.00 Welcome to SSRCTS
Vibeke Hjortdal, Aarhus, Denmark
- 15.00 - 15.10 The feedback concept
Zarmiga Karunanithi, Aarhus, Denmark

15.10 - 16.10 Oral Session 1

Chairmen: Lisa Carlson Hanse, Camilla Mensel

8+5 minutes for each presentation

- O1 - p. 10 Immunoglobulin G4-related inflammation of aortic and mitral valves
Ari Mennander, Eetu Niinimäki, Timo Paavonen, Ivana Kholova
- O2 - p. 11 Biomechanical characterization of the regional loss and storage moduli of the thoracic aorta
Mariam Abdi Noor, Jens Vinge Nygaard, J. Michael Hasenkam, Peter Johansen
- O3 - p. 12 Cardiac Magnetic Resonance Imaging in Adults with Small Unrepaired Atrial Septal Defects
Nicolai Boutrup, Sebastian Udholm, Steffen Ringgaard, Vibeke E. Hjortdal
- O4 - p. 13 A new intelligent stocking for quantification of edema in the lower limbs
Alexander Emil Kaspersen, Olav Bjørn Petersen, J. Michael Hasenkam
- 16.10 - 16.25 Coffee Break

16.25 - 16.45 Poster Session 1

Chairmen: Zarmiga Karunanithi, Nicolai Boutrup

3+3 minutes for each presentation

- P1 - p. 14 Lymphatic Function and Morphology in Women who have undergone Breast Cancer Treatment
Mathias Alstrup, Sheyanth Mohanakumar, Birgitte V. Offersen, Vibeke E. Hjortdal
- P2 - p. 15 Biomechanical properties of porcine small intestinal submucosa matrix compared with porcine mitral valve leaflets
Lejla Islamagic, Marcell J. Tjørnild, Lisa Carlson Hanse, Jens Vinge Nygaard, J. Michael Hasenkam



- P3 - p. 16 Research protocol of the use of interferon β 1 to attenuate the ischemia reperfusion injury in acute myocardial infarct in pigs
Siiri A. M. Niittynen, Laura Liikamaa, Juho Jalkanen, Timo Savunen, Jarmo Gunn, Vesa Anttila, Markus Malmberg

16.45 - 17.15 Invited Lecture

Anders Ahlsson, Associate Professor MD PhD
Department of Cardiothoracic Surgery, Karolinska University Hospital, Sweden.
"Postoperative atrial fibrillation"

Chairman: Ignacio Lugones
20+10 minutes

- 17.15 - 17.30 Coffee Break

17.30 - 18.10 Oral Session 2

Chairmen: Mathias Alstrup, Mandy Salmon
8+5 minutes for each presentation

- O5 - p. 17 Extending the 1h warm ischemia limit in lungs donated after circulatory death - Evaluating effects of in vivo ventilation or liraglutide on lungs subjected to warm ischemia with ex vivo lung perfusion
Mathilde M. B. Hebsgaard, Thomas Nikolaj Bang Lilleør, Ulver S. Lorenzen, Hannelouise Kissow, Peter Skov Olsen, Christian H. Møller
- O6 - p. 18 Indication and Timing of Surgery Are Essential in Stabilization of the Chest Wall in Flail Chest Trauma Patients
Ali Imad El-Akkawi, Frank Vincenzo De Paoli, Morten Bendixen, Thomas Decker Christensen
- O7 - p. 20 Bicuspid aortic valve and ascending aortic wall degeneration
A Mennander, S Pelttari, I Kholová, T Paavonen

- 18.10 - 18.25 Coffee Break

18.25 - 18.55 Invited Lecture

Jens Erik Nielsen-Kudsk, Professor MD PhD
Department of Cardiology, Aarhus University Hospital
"Fracturing small deteriorated bioprosthetic valves before Valve-in-Valve TAVI. From bench to first in man experience"

Chairman: Anders Ahlsson
20+10 minutes

- 18.55 - 20.00 Break

- 20.00 Dinner

SCIENTIFIC PROGRAM

FRIDAY, FEBRUARY 8

14.00 - 14.45 Guðbjartsson Award Session 1

Chairmen: Ari Mennander

8+5 minutes for each presentation

- G1 - p. 21 Dextran-based prime vs. crystalloid and mannitol-based prime in adult cardiac surgery: A prospective randomized study
Mikael Barbu, Oscar Kolsrud, Sven-Erik Ricksten, Göran Del-Igren, Anne-Li Sigvardsson, Henrik Zetterberg, Kaj Blennow, Kerstin Björk, Anders Thorén, Christoffer Hansson, Anders Jeppsson
Discussant: Mathilde Hebsgaard
- G2 - p. 23 Induction of purinergic signaling by interferon-beta-1 in myocardium
Siiri A. M. Niittynen, Juho Jalkanen, Emma Viikinkoski, Markus Malmberg, Tuomas Kiviniemi
Discussant: Zarmiga Karunanithi
- G3 - p. 24 Neurodevelopmental outcomes in adults with repaired atrial septal defect
Benjamin Asschenfeldt, Johan Heiberg, Simon Eskildsen, Leif Østergaard, Lars Evald, Vibeke Elisabeth Hjortdal
Discussant: Torben Hoffmann

14.45 - 15.15 Invited Lecture

Eeva Moilanen Professor MD PhD

University of Tampere, Finland

"Inflammation during cardiac surgery"

Chairman: Anders Jeppsson

20+10 minutes

15.15 - 15.30 Coffee Break

15.30 - 16.00 Guðbjartsson Award Session 2

Chairmen: Peter Johansen

8+5 minutes for each presentation

- G4 - p. 25 Identifying Risk Factors Associated with Rheumatic Heart Disease in Nepal - The Potential Role of Vitamin D Deficiency
L Thorup, P Kallestrup, B Koirala, A Tripathy, D Neupane, B Gyawali, SA Hamann, VE Hjortdal
Discussant: Mariam Abdi Noor



- G5 - p. 26 Differences in causes of and characteristics associated with early and late readmission after open heart valve surgery
Marc Gjern Weiss, Jordi Sanchez Dahl, Lars Riber, Kirstine Lærum Sibilltz, Emilie Karensen Lykking, Jacob Eifer Møller, Britt Borregaard
Discussant: Lisa Carlson Hanse

16.00 - 16.30 Invited Lecture

Malakh Shrestha MD, PhD, Associate Professor
Department of Cardiothoracic, Transplantation & Vascular Surgery, Hannover Medical School, Germany
"Aortic Surgery"

Chairman: Vibeke Hjortdal
20+10 minutes

16.30 - 17.00 Invited Lecture

Alexander Wahba, Professor MD PhD
Department of Cardiothoracic Surgery, St. Olavs University Hospital, Trondheim, Norway.
"Quality of Life"

Chairman: Lisa Carlson Hanse
20+10 minutes

- 17.00 - 19.30 Wet Lab
19.30 - 20.00 Break
20.00 Dinner with hosts

SCIENTIFIC PROGRAM

SATURDAY, FEBRUARY 9

14.00 - 14.45 Oral Session 3

Chairmen: Mariam Abdi Noor, Lejla Islamagic

8+5 minutes for each presentation

- 08 - p. 28 A new pulmonary valve repair technique for congenital heart surgery: in vitro evaluation
L. Carlson Hanse, M.J. Tjørnild, P. Johansen, I. Lugones, V.E. Hjortdal
- 09 - p. 30 Analysis of Device Deployment and Tug Test Forces During Left Atrial Auricle Occlusion
Mandy Salmon, Karen Eich Hammer, Henrik Engholt, Rasmus Nybo, Jens Erik Nielsen-Kudsk, Peter Johansen

14.45 - 15.15 Invited Lecture

Ignacio Lugones, MD PhD

Cardiac Surgery, Hospital General de Ninos Pedro de Elizalde,
Buenos Aires, Argentina

"Innovation without formal research in congenital heart surgery"

Chairman: Lisa Carlson Hanse

20+10 minutes

15.15 - 15.30 Coffee Break

15.30 - 16.00 Invited Lecture

Ingvar Berg, MD

Emergency physician, Haaglanden Medical Center, The Hague,
The Netherlands

"Think aorta"

Chairman: Tomas Guðbjartsson

20+10 minutes

16.00 - 16.20 Poster Session 2

Chairmen: Mathilde Hebsgaard, Lene Thorup

3+3 minutes for each presentation

- P4 - p. 32 Reducing readmission to hospital after heart surgery
T. Hoffmann, C. Ilkjær, J. Heiberg, V. Hjortdal
- P5 - p. 33 Atrial septal defect - exercise capacity and pulmonary hypertension
Zarmiga Karunanithi, Farhad Waziri, Steen Hvitfeldt, Vibeke E Hjortdal



- P6 - p. 34 Preoperative screening for iron-deficiency in vascular patients to reduce blood transfusions
C. Mensel, N. Eldrup, P. Juhl-Olsen, V. Guldbrandt, M. Eivindson

16.20 - 16.50 Invited Lecture

Tomas Guðbjartsson MD, PhD, Associate Professor
Department of Surgery and Cardiothoracic Surgery, Landspítali
University Hospital, Iceland
"How to publish as a non-speaking english surgeon"

Chairman: Peter Johansen
20+10 minutes

- 16.50 - 17.30 Coffee Break & Award Committee meeting
17.30 - 18.00 Awards
18.00 - 18.30 Evaluation
Beer & Business
18.30 - 19.15 Jeopardy
19.15 - 20.00 Break
Dress to Impress!
20.00 Presidential Dinner with Pompous Speeches

ABSTRACTS

ORAL, POSTER AND GUBBJARTSSON AWARD SESSIONS

Immunoglobulin G4-related inflammation of aortic and mitral valves*Ari Mennander¹, Eetu Niinimäki¹, Timo Paavonen¹, Ivana Kholova¹*¹ Tampere University Heart Hospital, Tampere University Hospital, University of Tampere, Fimlab, Finland

Background: Autoimmune immunoglobulin G4 (IgG4)-related disease may induce retroperitoneal fibrosis and affect various sites of the aorta. There are sparse data on IgG4-related disease of the heart valves.

Materials and Methods: Sixty consecutive resected heart valves were included (48 aortic and 12 mitral valves). Immunohistochemistry for CD38, IgG and IgG4 was performed using Ventana Lifesciences Benchmark XT Staining module.

Results: There were 44 males and 16 females with a mean age of 60 years. Endocarditis was present in 24 valves, of which 19 had acute endocarditis, 3 chronic endocarditis, and 2 healed endocarditis. Degeneration was confirmed in 36 cases, of which 17 had significant inflammation without full criteria of endocarditis. Altogether, 4 heart valves included IgG4 positive plasma cells per high definition microscopy field associated with the diagnosis of IgG4-related disease, though two of these had only no more than 20 IgG4 positive cells per high definition field.

Conclusions: IgG4-related disease may be revealed from heart valves. This may have important clinical consequences in treating and following the patients after surgery.



Biomechanical characterization of the regional loss and storage moduli of the thoracic aorta

Mariam Abdi Noor^{1,2}, Jens Vinge Nygaard², J. Michael Hasenkam¹, Peter Johansen^{1,2}

1 Dept. of Cardiothoracic and Vascular Surgery, Aarhus University Hospital, Aarhus

2 Dept. of Engineering, Aarhus University, Aarhus

Background: An aortic aneurysm is a lethal arterial disease that mainly occurs in the thoracic and abdominal regions of the aorta. The rupture of an aneurysm is a biomechanical failure that occurs when the stresses exerted on the aortic wall exceed the tissue's capacity to sustain stress. Because the aorta is viscoelastic its mechanical properties depend on strain rate and diameter. Viscoelastic properties of a material are characterized by a storage and loss moduli. To obtain knowledge about wall properties in aorta this study focuses on using energy functions to determine changes in the aortic wall complementary to the loss and storage moduli. Energy functions have the advantage of providing information on the entire tensile stress and strain ranges and thereby provide a new insight to the changes in the vessel wall.

Material and Methods: In this study thoracic porcine aortas (n=13) were tested in three different regions. Ascending, arcus and descending aorta. Each region was divided into three segments. Tensile testing was made by a 3200 Bose (Eden Prairie, MN, USA) tensile testing machine. For the dynamical mechanical analysis, a sinusoidal displacement loading protocol was used. Samples were loaded over frequencies ranging from 0.5 Hz up to 5 Hz. Between 0.5 and 5 Hz, testing frequencies will be increased at 0.5 Hz intervals.

Tests were made in the axial and circumferential directions. Statistical comparisons of data were made between aortic regions and segments.

Results: The results indicate that there is a difference in the storage moduli and loss moduli by a factor of ten (1:10) in all the regions of the thoracic aorta. Furthermore, in each segment the axial direction exhibits less changes of mechanical behaviour compared to the circumferential direction.

Conclusion: From the results it can be concluded that strain energy functions across the aortic wall has a very large amount of storage moduli compared to loss moduli. Additionally, each of the three aortic regions have different frequency responses.

Cardiac Magnetic Resonance Imaging in Adults with Small Unrepaired Atrial Septal Defects

Nicolai Boutrup¹, Sebastian Udholm¹, Steffen Ringgaard², Vibeke E. Hjortdal¹

- 1 Department of Cardiothoracic and Vascular Surgery, Aarhus University Hospital, Denmark
- 2 The MR Research Centre, Aarhus University Hospital, Aarhus, Denmark

Background: In a recent Danish nationwide registerbased study, adults with small, unrepaired atrial septal defects (ASD) have been found with increased risk of pneumonia, atrial fibrillation and stroke. Moreover, they revealed higher mortality than the background population. We wish to characterize adult patients with small unrepaired ASD patients by investigating the dimensions and the morphology of the left ventricle (LV).

Methods: In a clinical case-control study, we included adult patients with small, unrepaired ASD and healthy age- and gender matched controls. The entire ASD group is previously identified through the Danish National Patient Registry and consists of all Danish patients, aged 18-65 and diagnosed between 1977-2011 with an unrepaired ASD. The included patients were divided into two subgroups: (1) patients with an open ASD and (2) patients with a spontaneously closed ASD, given most of the ASDs were spontaneously closed since the time of diagnosis. Dimensions and morphology of the LV were examined using cardiac magnetic resonance imaging.

Results: A total of 723 patients were identified with a small, unrepaired ASD in Denmark. We included a total of 41 patients (mean age 36.2y, 68% woman) and 20 healthy controls (mean age 35.3y, 59% woman). Approximately, one-third had open defects (n=15), whereas the majority of defects (n=26) were spontaneously closed since time of diagnosis.

ASD patients, both open (n=15) and spontaneously closed (n=26), were not significantly different when compared to controls in all three measured outcomes; (1) enddiastolic volume (ml)±SD (open defects: 149.8±33.5; spontaneously closed ASD: 155.9±33.0; and controls: 166.9±27.3), (2) end-systolic volume (ml)±SD (open defects: 58.7±20.3; spontaneously closed ASD: 60.7±15.8; and controls: 68.1±14.8) and (3) cardiac output (l/min)±SD (open defects: 7.0±1.6; spontaneously closed ASD: 7.2±1.5; and controls: 6.9±1.5).

Conclusion: Patients with small, unrepaired ASD have normal dimensions of the LV at rest, regardless of whether the defect had spontaneously closed. More data needs to be analysed to establish whether these patients have abnormalities in the right side of the heart, both atrium and ventricle. Further, we need to determine potential changes during exercise in the pulmonary and aortic blood flow.



A new intelligent stocking for quantification of edema in the lower limbs

Alexander Emil Kaspersen^{1,2}, Olav Bjørn Petersen³, J. Michael Hasenkam^{1,2}

- 1 Department of Cardiothoracic and Vascular Surgery, Aarhus University Hospital
- 2 Aarhus University, Department of Clinical Medicine
- 3 Department of Gynaecology and Obstetrics, Aarhus University Hospital

Background: The balance of the body fluids is strictly regulated within a narrow range. It is controlled by water movement between the interstitial compartment and the capillaries. An unnatural balance between the two compartments can be seen in several diseases, which leads to a net filtration out of the vascular space, resulting in the formation of edema. Monitoring of edema formation therefore represents a unique way of evaluating the degree of the underlying disease and effect of treatment. No current method provides continuous quantitative assessment of edema. We hypothesized this is feasible with an intelligent stocking which continuously measure lower leg volume. The aim of the study was to evaluate the Edema Stocking device (ESD) as a tool for continuous quantification of edema compared with water displacement volumetry (WDV).

Materials and methods: We included 6 pregnant women aged 28-38 years (mean \pm SD: 34.2 \pm 3.8) from the dept. of Gynecology and Obstetrics Y, Aarhus University Hospital. Each woman had her volume of the lower extremity measured with both ESD and WDV (control group). In each of 3 successive days, two measurements were performed in the morning and two in the evening. Likewise, a continuous monitoring of the edema formation was performed with ESD for 1 hour each day.

Results: Results on both reliability and accuracy was obtained. Overall reliability was as seen in prior studies on methods in estimating limb volume. Mean difference between ESD and WDV was 208.8 ml \pm 144.3 ml. Mean difference between days was 4.2 ml, indicating higher volumes in the evening. Accuracy was evaluated by Bland-Altman plot and linear regression analysis. Limits of Agreement was measured to -74.1;491.7 ml, while Pearson's coefficient for regression analysis was 0.906. Generally, ESD exhibited lower volumes than WDV. Lower leg volume changed as expected to gravitational changes.

Discussion: Despite a slight systemic bias, the ESD holds promises for a future method for on-line quantitative method for edema assessment in the lower extremity or as a research tool for new insight into vascular physiology and development of edema. The regression analysis showed good correlation between the two methods, but the ESD generally measured volume to be approximately 200 ml lower than volumes measured by WDV. However, data from a larger cohort of patients is needed.

Lymphatic Function and Morphology in Women who have undergone Breast Cancer Treatment

Mathias Alstrup¹, Sheyanth Mohanakumar¹, Birgitte V. Offersen², Vibeke E. Hjortdal¹

- 1 Department of Cardiothoracic and Vascular Surgery, Aarhus University Hospital, Denmark
- 2 Department of Oncology, Aarhus University Hospital, Denmark

Background: Breast cancer treatment, involving axillary surgery and radiation therapy, can partially obstruct lymph outflow from the arm, chronically raising the lymphatic smooth muscle afterload. This may lead to lymphatic pump failure, as in hypertensive cardiac failure, and could explain features of breast cancer treatment-related lymphedema (BCRL) such as its delayed onset.

Studies have shown a change in contractile function of the lymphatic vessels and recognize distinct lymphatic patterns in women diagnosed with BCRL, but no studies have investigated whether these changes occur before clinical edema is detectable.

Material and methods: The morphological state of the lymphatic vessels will be described using T2-weighted non-contrast MRI and Near-Infrared Fluorescence (NIRF) imaging. The contractile function of the lymphatic vessels will be assessed through NIRF imaging and the end-points will consist of contraction frequency, velocity and pumping pressure. The study population will be 28 patients treated for breast cancer. Both the treated as well as the non-treated arm will be examined, and thus the patients serve as their own controls.

Results: Results pending.

Perspectives: Studies have shown that if BCRL treatment is implemented before the recognition of clinical BCRL the incidence of BCRL can be significantly reduced. If changes can be shown in contractile function and/or morphology of the lymphatic vessels in patients destined to develop BCRL assessment of contractile function and/or the morphological changes can be used as tool for grading the risk of developing BCRL after treatment. BCRL treatment could be offered to patients in risk of developing BCRL prior to the recognition of clinical edema and thereby reduce the incidence of BCRL.



Biomechanical properties of porcine small intestinal submucosa matrix compared with porcine mitral valve leaflets

Lejla Islamagic^{1,2}, Marcell J. Tjørnild^{1,2}, Lisa Carlson Hanse^{1,2},
Jens Vinge Nygaard³, J. Michael Hasenkam^{1,2}

- 1 Department of Cardiothoracic and Vascular Surgery, Aarhus University Hospital
- 2 Department of Clinical Medicine, Aarhus University
- 3 Department of Engineering, Aarhus University

Background: Valve repair is preferred over replacement for treatment of mitral valve regurgitation. Porcine small intestinal submucosa extracellular matrix (SIS-ECM, CorMatrix) is a potential new mitral leaflet patch material for valve repair based on promising results with implantation in right sided cardiac cavities. Due to the high pressures exerted on the mitral valve, the biomechanical property demands of patches are accordingly high. Studies performed using the material for valve repair show conflicting results regarding inflammation, fibrosis, and calcification. Thus, the use of the material here is still subjected to significant uncertainties. The stress-induced changes could be explained by different thickness-specific biomechanical properties of the material compared with native leaflets. The aim of this study is therefore to compare the biomechanical properties of the anterior and posterior porcine mitral leaflet and porcine SIS-ECM (2-layer and 4-layers) at physiological frequencies.

Methods: Samples from the anterior and posterior leaflets will be excised in radial and circumferential directions. Two variants of porcine SIS-ECM will be obtained: 2-layers and 4-layers. In total: four groups. All leaflet- and SIS-ECM samples will be cut with a puncher and mounted in our Bose ElectroForce 3200 apparatus. Dynamic mechanical testing and a uniaxial test until rupture will be performed to determine properties such as maximum strength properties, loss- and storage modulus.

Results: Preliminary results of the uniaxial test show a significant maximum tear strength difference between the anterior and posterior leaflet: approximately 3.5 N for the anterior leaflet and 1.2 N for the posterior leaflet. This is not the definitive mean, and a large variation is seen for the anterior leaflet. A regional maximum strength variation is seen in the anterior leaflet depending if the sample was excised from the clear- or rough zone: the clear zone samples had a lower maximum tear strength of about 2.1 N. Studies are still ongoing.

Perspective: By investigating the properties of porcine SIS-ECM and native porcine mitral valve leaflets, we wish to clarify what biomechanical properties are required of biological graft materials for mitral valve repair and whether porcine SIS-ECM is suited as a mitral repair material.

Research protocol of the use of interferon β 1 to attenuate the ischemia reper-fusion injury in acute myocardial infarct in pigs

Siiri A. M. Niittynen¹, Laura Liikamaa¹, Juho Jalkanen², Timo Savunen³, Jarmo Gunn³, Vesa Anttila³, Markus Malmberg³

- 1 Department of Surgery, University of Turku, Turku, Finland
- 2 Faron Pharmaceuticals, Turku, Finland
- 3 Heart Center, Turku University Hospital and University of Turku, Turku, Finland

Background: In acute myocardial infarct, the return of myocardial blood flow to the ischemic tissue propagates inflammation and cell destruction creating an ischemia-reperfusion (IR) injury. The tissue damage and metabolic changes activate inflammatory responses and increases the risk of electrical imbalance in myocardium. Inteferon β 1 (INF- β -1) is an anti-inflammatory cytokine which has been found to increase the ecto-5'-nucletidase (CD73) expression. The aim of this reaseach is to study the therapeutical potential of INF- β -1 in myocardial ischemia utilising a pig-let model.

Material and methods: Twenty two piglets weighing 25-30 kg were divided into a control group (n=10) and a treat-ment group (n=12). IR injury was induced by ligating the distal part of the left ascending coronary artery (LAD) for 30 minutes. In the treatment group, the animals received the first intravenous bolus (2,5 microg) of INF- β -1 eight hours before the ischemia. An additional dose (2,5 microg) of INF- β -1 was given right before ligating the distal LAD. In the control group, the animals received placebo accordingly. During the experiment, hemodynamic parameters were monitored and blood samples were taken. After six hours of re-perfusion, the animals were sac-rificed and tissues samples were harvested from heart, lung, and kidney.

Results: The animal experiments are completed and final results will be presented at the conference.

Conclusion: Conclusions will be presented at the conference.

Perspectives: Perspectives will be presented at the conference. Future studies are already planned.



Extending the 1h warm ischemia limit in lungs donated after circulatory death - Evaluating effects of in vivo ventilation or liraglutide on lungs subjected to warm ischemia with ex vivo lung perfusion

Mathilde M. B. Hebsgaard¹, Thomas Nikolaj Bang Lilleør¹, Ulver S. Lorenzen¹, Hannelouise Kissow², Peter Skov Olsen¹, Christian H. Møller¹

- 1 Department of Cardio-Thoracic surgery, RT, Rigshospitalet, University of Copenhagen, Denmark
- 2 NNF Center of Basic Metabolic Research and Department of Biomedical Sciences, University of Copenhagen, Denmark

It has been reported that reconditioning of donor lungs from circulatory death donor pigs with ex vivo lung perfusion (EVLP), is not possible if the duration of warm ischemia extend 1h. Lung transplantation is limited by a shortage of organs and the limited duration of warm ischemia restricts the usage of lungs donated after circulatory death. The aim of this study was to investigate if in vivo lung ventilation during warm ischemia or administration of liraglutide pre-mortem and during EVLP can extend the 1h warm ischemia limit.

Danish domestic pigs (N=19) were put down by ventricular fibrillation after blood sampling and bronchoalveolar lavage (BAL) and left for 2 hours of warm ischemia. In the group randomized to liraglutide a dose of 40 ug/kg were given i.v. 1 hour before death and in the group randomized to in vivo ventilation this was started 30 min after death. In the control group no intervention was performed. Lungs were removed, weighed, ventilated and perfused on EVLP system with perfusion buffer. In the group randomized to liraglutide a dose of 1.125 mg was added to the buffer. When connected to the EVLP a biopsy was taken from the middle lobe and perfusion samples were collected. After reconditioning in the system (88+/-17 min) lungs were evaluated at FiO₂ 100% and 21%. Perfusion samples and biopsies were collected and weight was recorded. Endpoints were physiological parameters (PaO₂, compliance and pulmonary vascular resistance) and Δ weight. IL-8 concentrations and myeloperoxidase activity was measured in BAL fluid, tissue homogenates and perfusion samples, and a histopathologic assessment score was performed in lung biopsies.

We found no significant difference ($p=0.740$) between the three groups, but 9/19 lungs passed the criteria for transplantation (PaO₂>13 kPa). We found no significant difference in compliance and PVR between the groups. No differences were found in levels of IL-8, myeloperoxidase activity or histopathological score between groups; however the score was significantly lowered in samples obtained after EVLP.

Results show that there is no significant difference in oxygenation capacity (PaO₂ kPa) between the three groups, indicating that despite the interventions; in vivo ventilation and liraglutide lungs subjected to more than 1 hour of warm ischemia tend not to meet the criteria for transplantation.

Indication and Timing of Surgery Are Essential in Stabilization of the Chest Wall in Flail Chest Trauma Patients

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Background: Clinically, flail chest is defined as paradox thoracic movement and radiographically with fractures of three or more consecutive ribs or costal cartilages in two or more places. Treatment of flail chest are often conservative. However, several surgical techniques have been used to stabilize a flail segment over the years. Surgery have shown its superiority compared to conservative treatment in regard to hospital stay, time with mechanical ventilation and risk of pneumonia. A recent consensus recommends surgical stabilization of flail chest within 72 hours.

Results:

Case 1

A 41 years old man was admitted to the hospital after being stepped on by a horse. The patient had a clinical flail chest and pneumothorax on the right side. The patient were stable and was treated conservatively with a chest tube and epidural pain catheter. However, due to continued paradox thoracic movement and insufficient pain management it was decided to surgically stabilize the right hemi thorax by fixating the posterior fractures of costa 6 - 8. At one year followup the patient experienced an improvement regarding pain level and was able to maintain his normal job.

Case 2

A 47 years old mad was admitted to the emergency room after being hit by a truck on the highway. At arrival, the patient were intubated but had circulatory distress. A trauma CT revealed a left sided hemothorax and costae fractures on 1 - 12 and 1 - 10 on the left and right side, respectively. An emergency thoracotomy and laparotomy was performed at the ER. Hemostasis was achieved and the patient was admitted at the ICU. After 16 days weaning from mechanical ventilation was not possible. The most dislocated posterior fractures of costa 5 - 7 were surgically fixated. Postoperatively the patient was weaned from mechanical ventilation, and was referred to rehabilitation. At 6 months followup the patient had no pain, no respiratory symptoms and was maintaining his regular job.

Conclusion: Surgical stabilization of only the posterior fractures in a flail segment is a safe approach with a high possibility of positive outcomes for the patients in regard to pain level and need for mechanical ventilation. However, there is a need of studies comparing different surgical approaches although such studies will be difficult to conduct due to a low number of surgical cases.

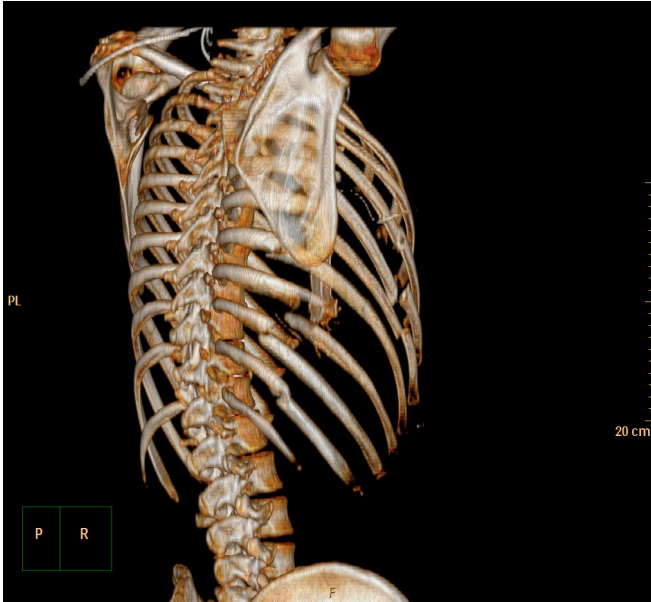


Figure text1:

Case 1 3D reconstruction of the trauma CT scan showing multiple costa fractures



Figure text2:

Case 1 Postoperative 3D reconstruction of CT scan at 1 year follow up.

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Bicuspid aortic valve and ascending aortic wall degeneration

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Background: Incongruous evidence suggest that bicuspid aortic valve (BAV) is associated with ascending aortic events such as aortic dissection during aortic valve regurgitation. Sparse da-ta exist on histopathology of the ascending aorta in patients with BAV.

Materials and Methods: 71 consecutive patients with surgically resected ascending aorta were included. Aortic dissection was present in one out of 24 BAV patients and 17 out of 47 tricuspid aortic valve (TAV) patients. Systematic histological quantification of the aortic wall degeneration was performed.

Results: There were 17 males with BAV and 32 with TAV. The mean age was 61 ± 13 years with BAV and 66 ± 9 years with TAV ($p=0.128$). Aortic valve regurgitation alone was not a risk factor for aortic dissection in all patients ($p=0.164$). However, patients without aortic valve re-gurgitation, aortic media degeneration (1.4 ± 0.5 vs 2.3 ± 0.5 , point score units [PSU], $p=0.001$), smooth muscle cell loss (5.4 ± 3.8 vs 8.3 ± 2.2 , PSU, $p=0.006$) and dissection (8% vs 58%, $p=0.005$) were less frequent in BAV as compared with TAV patients, respectively.

Conclusion: BAV without regurgitation is associated with decreased ascending aortic wall degeneration and dissection as compared with TAV patients. BAV alone is not indicative for complex aortic surgery encompassing major resection of the thoracic aorta.

Dextran-based prime vs. crystalloid and mannitol-based prime in adult cardiac surgery: A prospective randomized study

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Background: There is no consensus on the optimum prime fluid in adult cardiac surgery. A crystalloid solution contributes to a decrease in serum oncotic pressure which may contribute to interstitial oedema. We compared a new hyperoncotic priming solution containing dextran 40 that has an electrolyte composition that mimics extracellular fluid with a standard crystalloid-based prime.

Material and methods: Eighty cardiac surgery patients were included in this prospective, double-blind, randomized, single-centre study. The patients were randomized to either a dextran-based prime or a crystalloid prime containing Ringer acetate and mannitol. The primary end-point was colloid osmotic pressure (COP) in serum during CPB. Secondary endpoints included fluid balance, bleeding and transfusion requirements, pulmonary function, haemolysis, systemic inflammation, and markers of renal, hepatic, myocardial, and brain injury. Blood and urinary samples were collected before, during, and after CPB.

Results: Colloid osmotic pressure was maintained during and 10 min after CPB in the dextran group but not in the crystalloid prime group (18.8±2.9 vs. 16.4±2.9 mmHg on CPB and 19.2±2.7 vs. 16.8±2.9 mmHg after CPB; $p<0.001$ for both). Patients in the dextran group required less intravenous fluid during CPB (1090±499 vs. 1437±543 ml; $p=0.003$) and net fluid balance was less positive 12h after surgery (+1,430±741 vs. +1,901±922 ml; $p=0.014$). U-NAG/U-creatinine ratio was significantly lower in the dextran group 1 hour after CPB (2.5±2.7 vs. 4.7±6.3; $p=0.045$). Haemolysis index was significantly lower in the dextran group 2h after CPB (18.7±11.4 vs. 42.9±35.5; $p=0.001$). There were no significant differences in bleeding, transfusion requirements, organ function, systemic inflammation, or brain and myocardial injury markers between the groups at any time point.

Discussion: Our results suggest that a hyperoncotic dextran-based priming solution is safe, preserves intraoperative COP, reduces volume overload, reduces renal tubular damage and reduces haemolysis compared to crystalloid prime.

Colloid osmotic pressure

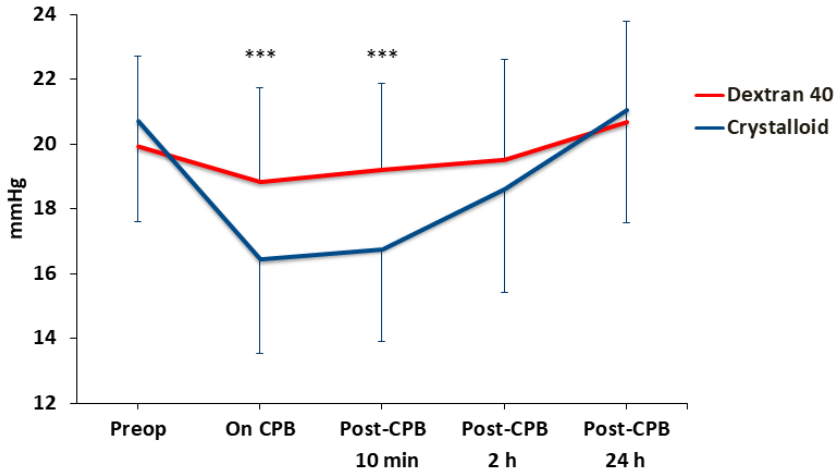


Figure text1:

Image depicting preoperative baseline colloid osmotic pressure and up to 24 hours after allocated intervention. Values are given as mean and standard deviation. *** $P < 0.001$ using ANOVA interaction.

Fluid balance

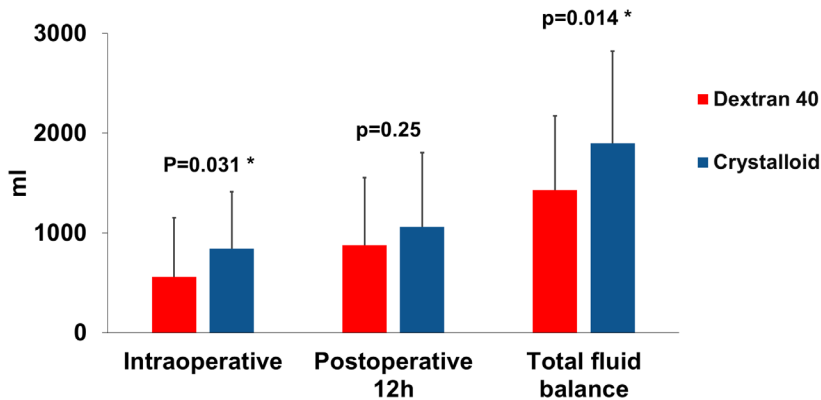


Figure text2:

Diagram illustrating fluid balance between the groups divided in the intraoperative period, the first 12 hours postoperative period and total fluid balance at 12 hours.



Induction of purinergic signaling by interferon-beta-1 in myocardium

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Background: In open heart surgery, systemic inflammatory response syndrome (SIRS) is induced by ischemia-reperfusion injury and by the use of cardiopulmonary bypass (CPB). The compensational mechanisms are inadequate to attenuate metabolic changes caused by SIRS. Ecto-5'-nucleotidase (CD73) mediated adenosine production has been postulated to possess cardioprotective qualities. The aim of the study was to assess the circulating levels of CD73 and to see, whether interferon-beta-1 (IFN-beta-1) affects CD73 activity in human cardiac myocytes.

Materials and methods: As part of the prospective CAREBANK study, in order to assess CD73 levels, pre- and postoperative blood samples were collected from patients (n=300) on-going either elective coronary artery bypass surgery or valve operation. Human right atrial appendage tissue samples were harvested from patients (n=10) and incubated with IFN-beta-1.

Results: The circulating levels of CD73 decreased during the operation, when measured pre- and postoperatively ($p < 0.001$). IFN-beta-1 induced CD73 expression in human myocardial cells, when incubated for a period of three days and compared with control (day 1, $p = 0.015$; day 3 $p = 0.35$).

Conclusion: Purinergic signaling is activated by IFN-beta-1, thus resulting in the increase of CD73 activity on the site, and suggesting IFN-beta's potential to act as a cardioprotective pharmacological agent.

Perspektives: Results suggest that interferon-beta-1 can be used preoperatively in cardiac surgery in cardioprotection to reduce the effect of SIRS.

Neurodevelopmental outcomes in adults with repaired atrial septal defect

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Background: Adolescents undergoing cardiopulmonary bypass surgery for complex congenital heart disease in childhood demonstrate a variety of neurocognitive impairments. These impairments are shown to affect the general intellectual functioning among other important neurocognitive functions. The present study examines the hypothesis that adults, who have undergone surgical or transcatheter closure of an atrial septal defect in childhood, have compromised general intellectual functioning.

Methods: In a prospective, cohort study two groups of participants were enrolled; 1) patients who had undergone corrective surgery or transcatheter closure of an isolated ASD between 1980 and 2000, and 2) healthy controls matched on age, gender, and education level. Intellectual outcome was assessed with the Wechsler Adult Intelligence Scale, Fourth Edition (WAIS-IV). The full scale intelligence quotient (FSIQ) and the four WAIS-IV Index scores; verbal comprehension (VCI), perceptual reasoning (PRI), working memory (WMI), and processing speed (PSI) were analyzed.

Results: A total of 41 ASD patients (35 surgical and 6 transcatheter closed), and 32 healthy controls were enrolled. Mean age was 27.7 (± 5.6) years in the ASD group and 25.5 (± 4.8) years in the control group. The FSIQ was lower in the surgical closed ASDs (92.9 ± 13.2 ; $p = 0.0002$) and in the transcatheter closed ASDs (93.3 ± 13.9 ; $p = 0.041$) compared with the control group (104.9 ± 11.9). The surgical closed ASDs demonstrated lower performances on all WAIS-IV index scores; VCI (90.1 ± 13.4 ; $p = 0.0007$), PRI (93.1 ± 14.8 ; $p = 0.006$), WMI (91.1 ± 11.9 ; $p = 0.003$) and PSI (103.7 ± 16.0 ; $p = 0.016$) compared with the control group. The transcatheter closed ASDs demonstrated lower performances on VCI (86.5 ± 11.6 ; $p = 0.02$), however, there were no differences in PRI ($p = 0.56$), WMI ($p = 0.09$) and PSI ($p = 0.18$) compared with the control group.

Conclusions: Surgical and transcatheter closure of an atrial septal defect is associated with reduced general intellectual functioning in adulthood. These findings show that ASD patients face neurodevelopmental challenges regardless of whether they are approached surgically or percutaneously.



Identifying Risk Factors Associated with Rheumatic Heart Disease in Nepal - The Potential Role of Vitamin D Deficiency

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- 7 Department of Clinical Medicine, Aarhus University, Denmark

Background: Rheumatic heart disease (RHD), the autoimmune response to group A streptococcal infections, remains the most commonly acquired heart disease in people <25 years and is a leading cause of premature death in low- and middle-income countries. Despite this, many questions remain unanswered, including what makes the host susceptible and the exact pathogenic mechanisms involved in disease development and progression.

Associations between Vitamin D deficiency and Group A Streptococcal pharyngitis, autoimmune diseases and rheumatic fever have been demonstrated, but larger studies are needed. Therefore, we describe nutritional status including serum concentrations of 25(hydroxyvitamin D in RHD patients in Nepal.

Methods: A case-control study of 99 RHD patients and 97 controls, selected by echocardiography and matched on sex and age from two public health facilities in Nepal. Dried Blood Spots were analysed for s-25(OH)D concentrations and anthropometric measurements performed along with a questionnaire for socioeconomic status (SES) classification.

Results: RHD patients had significantly lower s-25(OH)D concentrations with a mean of 38.7 nmol/l (range 8.7 – 89.4) compared with controls 44.7 (range 14.5 – 86.7) ($p=0.01$). There is a trend towards increased risk of disease with severity of hypovitaminosis D, though this relationship was insignificant when adjusted for confounders. Mean age of RHD patients was 31 years (± 11) and controls 32 (± 11) with a 4:1 female to male ratio. BMI was significantly lower in RHD patients (22.6; 95% CI, 21.5-23.2) compared with controls (24.2; 95% CI, 23.3-25.1). RHD patients had lower SES ($p=0.001$), with 45% belonging to the poorest class.

Perspectives: Rheumatic heart disease patients are characterized by low s-25(OH) D, BMI and socioeconom-ic status. We should consider malnutrition as a risk factor for developing rheumatic heart disease. Furthermore, it's worth investigating vitamin D supplementation as a way to improve treatment outcomes or maybe even as a preventive strategy against rheumatic heart disease.

Differences in causes of and characteristics associated with early and late re-admission after open heart valve surgery

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Background: Readmissions after open heart valve surgery are frequent, and causes are numerous. The objective of the study was to i) describe causes of readmission from discharge to 30 days and from day 31 to 180 days after discharge; ii) investigate characteristics associated with overall and cause specific readmissions after heart valve surgery

Material and methods: We retrospectively reviewed consecutive data on patients undergoing open heart valve surgery from August 2013 to August 2016, obtained from electronic patient records.

Time to first readmission was analysed using univariable and multivariable Cox proportional hazard models, multifactorially adjusted. Results are reported as hazard ratio (HR), 95% confidence interval (CI) and a p-value <0.05 was considered statistically significant.

Results: In total, 980 patients were identified with 366 patients (37%) experiencing an unplanned cardiac readmission within 180 days after discharge.

During the first 30 days after discharge, the most prominent causes of readmission were peri-cardial effusions (n=64), infections (n=50) and atrial fibrillation/flutter (n=45), whereas infections (n=32), others related to the surgery (n=28), atrial fibrillation/flutter (n=16) and pleural effusion (n=7) were common from day 31 to 180 after discharge.

No variables associated with overall readmission were identified and the overall power of the models was low, with only prior surgery (HR 0.50 CI 0.27;0.92) being significantly associated with a lower risk of readmission within 30 days, and intensive care unit length of stay (HR 1.03 CI 1.01;1.05) significantly associated with readmission between day 31 to 180. In contrast, several different characteristics were associated with cause specific readmissions due to pleural and pericardial effusions, atrial fibrillation/flutter, infections and due to unspecified cardiac causes in the 0 to 180 days sub-group analyses, table.

Conclusion: Predicting overall readmissions after open heart valve surgery is difficult as causes of readmissions vary and different causes are associated with different variables. Knowledge on specific causes and associations should be implemented when attempting to prevent readmissions after heart valve surgery and are crucial in clinical follow-up.

	All readmissions within 0-30 days	All readmissions within 31-180 days	Readmission due to pleural or pericardial effusion, 0-180 days	Readmission due to atrial fibrillation/flutter, 0-180 days	Readmission due to any infection, 0-180 days	Readmission due to unspecific cardiac symptoms, 0-180 days
Age ≤65	Adjusted HR (CI) ^b 1.15 (0.80;1.67)	Adjusted HR (CI) ^c 0.64 (0.36;1.16)	Adjusted HR (CI) ^d 1.85 (1.18;2.88)*	Adjusted HR (CI) ^d 1.00 (0.56;1.79)	Adjusted HR (CI) ^d 1.04 (0.56;1.94)	Adjusted HR (CI) ^d 0.68 (0.31;1.51)
Age 66-75 (ref.)	1.0	1.0	1.0	1.0	1.0	1.0
Age ≥76	1.13 (0.81;1.58)	0.76 (0.47;1.25)	0.63 (0.34;1.18)	0.96 (0.49;1.86)	1.28 (0.76;2.17)	1.00 (0.45;2.24)
Sex, male	1.00 (0.76;1.32)	1.01 (0.67;1.54)	1.85 (1.11;3.09)*	0.91 (0.53;1.56)	0.58 (0.37;0.90)*	0.90 (0.45;1.80)
Alcohol use above national guidelines	1.17 (0.81;1.70)	0.85 (0.44;1.65)	1.99 (1.22;3.24)*	0.30 (0.07;1.23)	1.23 (0.63;2.39)	0.75 (0.23;2.43)
Reduced lung function ^a	1.20 (0.93;1.55)	0.97 (0.65;1.45)	1.25 (0.83;1.89)	0.78 (0.45;1.35)	1.18 (0.75;1.85)	1.98 (1.03;3.81)*
Ischemic heart disease with previous percutaneous coronary intervention	0.99 (0.65;1.52)	1.29 (0.70;2.37)	0.48 (0.19;1.20)	2.94 (1.53;5.63)*	1.06 (0.48;2.33)	0.66 (0.16;2.81)
Aortic regurgitation vs stenosis (ref.)	1.22 (0.87;1.70)	1.63 (0.98;2.69)	1.06 (0.63;1.79)	1.69 (0.77;3.71)	1.41 (0.73;2.70)	2.87 (1.28;6.42)*
Mitral valve procedure vs aortic valve procedure (ref.)	0.92 (0.75;1.30)	3.29 (0.77;14.09)	1.86 (1.11;3.10)*	2.10 (1.23;3.59)*	1.00 (0.58;1.72)	0.70 (0.29;1.71)
Mechanical vs. biological valve prosthesis (ref.)	1.28 (0.92;1.79)	1.15 (0.68;1.95)	1.42 (0.87;2.31)	0.92 (0.54;1.57)	1.07 (0.57;2.02)	1.07 (0.43;2.68)
New onset postoperative atrial fibrillation	1.03 (0.80;1.32)	1.37 (0.94;2.00)	1.20 (0.80;1.80)	1.71 (1.03;2.85)*	1.07 (0.69;1.68)	0.87 (0.45;1.70)

Association between clinical variables and readmission. Individual variables adjusted for possible confounders (see below)

^a Patients with forced expiratory volume ≤80% of predicted value and/or a history of chronic obstructive pulmonary disease

^b Adjusted for: sex, age, type of procedure, estimated glomerular filtration rate

^c Adjusted for: sex, age, diagnosis, prior surgery, estimated glomerular filtration rate, duration of ECC and length of stay.

^d Adjusted for: sex, age, valve disease

* A-P-value of <0.05 were considered significant

Figure text:

Demographic and clinical characteristics associated with readmission for all- and cause specific readmissions.

A new pulmonary valve repair technique for congenital heart surgery: in vitro evaluation

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Background: Congenital pulmonary valve abnormalities are commonly treated through a two-step surgical approach; (i) initial repair in infancy and (ii) pulmonary valve replacement later in life. To avoid an undersized prosthetic valve, the optimal time to perform the pulmonary valve replacement would be in adulthood. However, prolonging surgery is associated with right ventricular dysfunction and cardiac death. Our aim is to bypass the second surgery and thereby avoid complications associated with repaired pulmonary valves in children born with congenital heart defect.

Materials and Methods: Eight pulmonary roots explanted from porcine hearts were evaluated in a pulsatile flow loop model at cardiac output of 3 L/min, 4 L/min, 5 L/min and 6 L/min. After testing the native pulmonary root, the native cusps were explanted. Three cusps, designed based on a mathematical model and made from 0.6% glutaraldehyde-treated autologous pericardium, were subsequently implanted. The characterization will be based on geometric data from high-speed camera images, hydrodynamic data from echocardiography and ventricular and pulmonary artery pressure measurements.

Results: The cusp repair properly opened and closed in each pulsatile cycle. Visually, the native valve and the cusp repair looks similar in both systole and diastole, Figure 1. There was no transpulmonary pressure gradient through increased cardiac output from 3 L/min (2.1 ± 1.5 mmHg vs 1.9 ± 1.7 mmHg, $P = 0.6$, 95% CI -1.1 to 0.6) to 6 L/min (1.8 ± 1.7 vs. 2.0 ± 1.8 , $P = 0.7$, CI -0.8 to 1.3). Echocardiographic data and high-speed camera images remains to be analysed.

Conclusion/Perspective: The cusp repair is a fully functional repair technique of the pulmonary cusps. It appears comparable to the native valve in both systole and diastole and it cause no stenosis. With continuous promising results, our method of pulmonary cusp repair should be investigated in vivo mimicking the complex interactions seen in a beating heart. This study has the potential to bring us one step closer to a surgical approach that reduces the risk of long-term complications for children born with pulmonary valve abnormalities.

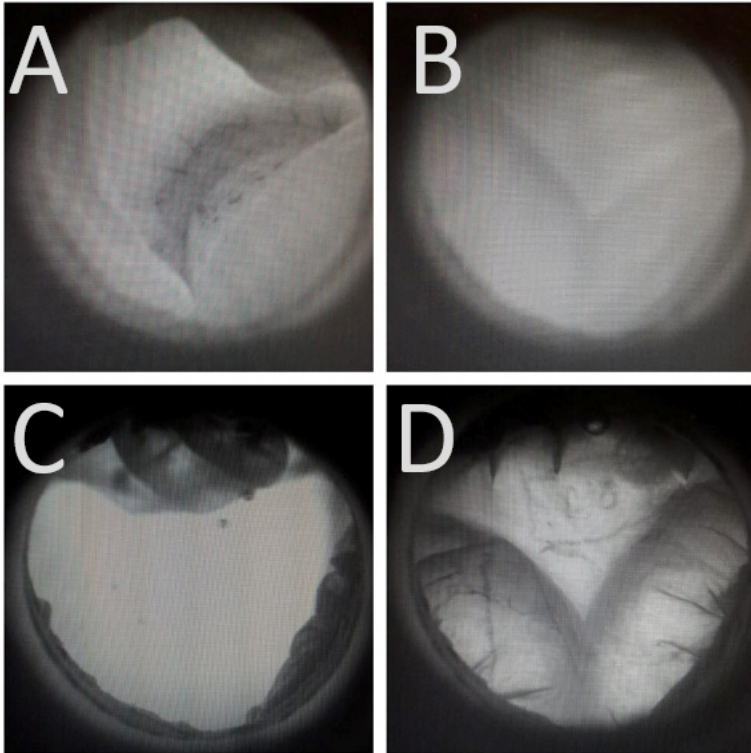
**Figure text1:**

Figure 1: High speed camera images (A+B) shows the native pulmonary valve in systole (A) and diastole (B). High speed camera images (C+D) shows the repaired pulmonary cusps in systole (C) and diastole (D).

Analysis of Device Deployment and Tug Test Forces During Left Atrial Auricle Occlusion

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Background: In patients with atrial fibrillation, thrombus formation (most frequently occurring in the left atrial auricle) may lead to stroke. Left atrial auricle occlusion (LAAO) may therefore prevent stroke by mechanically closing the entrance to the left atrial auricle using a percutaneous device. After deployment, some physicians employ a “tug test,” in which they pull on the catheter to ensure secure device placement. Current clinical knowledge of the benefit and safety of this test remains unclear. The aim of this study is to evaluate the use of the tug test, where a force transducer will be connected to the catheter used to deploy the percutaneous device.

Material and methods: The AMPLATZER Amulet (St. Jude’s Medical) device was used for occlusion. The device consists of a lobe, which inserts into the left atrial auricle, and a disc, which seals the entrance to the auricle from the atrial side of the heart. The device was implanted in six explanted porcine hearts. A bending beam force transducer coupled to a clamp recorded forces in the catheter wire during deployment and subsequent tug test. Three trials of deployment plus tug test were performed on each heart, along with an evulsion test. Maximum force was compared during deployment and tug test.

Results: An example of a force recording can be seen in Figure 1. Analysis of data showed device unfolding forces exceeded tug test forces ($p > 0.05$), implying that the tug test is not necessary to validate stability and may only increase risk of tissue damage or device embolization. Additional *in vivo* studies will be performed with a sterilized force transducer in human patients undergoing LAAO. Results will be used with existing *ex vivo* data to make recommendations to physicians for optimal device deployment and patient safety.

Discussion/Perspectives: This study yields crucial data on the optimal procedure for placing an LAAO device. To date, there remains disagreement in the medical community in regard to the necessity of the tug test, and this data clarifies existing recommendations. There is large variability between patients with regard to auricle size and anatomy, and future studies will be performed to group results according to these categories. This information will eliminate the guess work involved in the decision to perform a tug test, increasing patient safety and procedural success.

20 mm occlusion device, 80 kg porcine heart, device deployment and tug tests

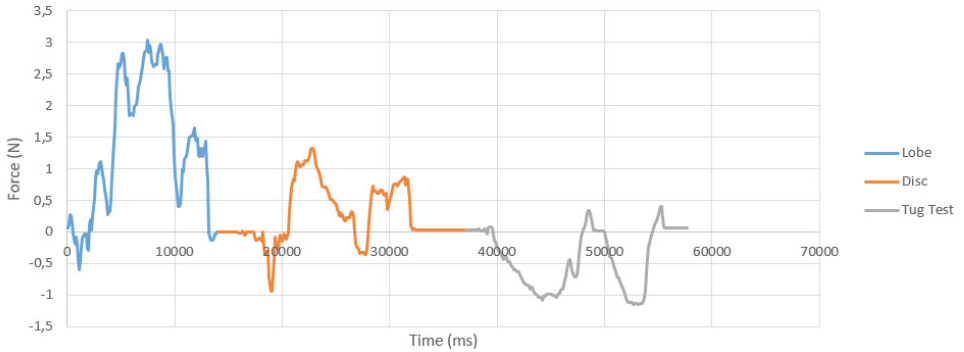
**Figure text1:**

Figure 1: Force curve showing the deployment of a 20 mm occlusion device in ex vivo porcine heart studies. Note that the magnitude of device unfolding force exceeds that of the tug test force.

Reducing readmission to hospital after heart surgery

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Background: Epidemiologic studies have showed, that the 30 days mortality after heart surgery has improved through the past 12 years, although the 1 year mortality has not been improved equally. Heart death is the main cause of death the first year after heart surgery and nearly every fifth patient was readmitted to the hospital in the first 30 days after surgery, though mostly because of uncomplicated conditions such as suboptimal medical treatment, infection or pleural effusion. This indicates a potential for improvement in timely post-operative follow-up.

Methods: Therefore we have established an outpatient student run clinic, where we do postoperative follow-up two and four weeks after the surgery. The effect of intervention will be measured by a 6MWT, direct spirometry, focused ultrasound examination of the heart and pleural cavities, wound inspection, control of the subscribed medicine and a questionnaire about life quality. Wounds will be clinical examined, photo documented and differences in skin temperature will be measured in order to detect early signs of infection. The length of hospitalization, numbers of readmission potential death will be registered up to 1 year after initially discharge from surgery. Endpoint includes readmissions to a hospital, the degree of heart failure and general level of function. The intervention group will be compared to a control group.

Results: Results are pending.

Perspectives: We believe that closer post-operative follow-up after heart surgery will have a positive benefit on the patients physical capacity, pleural and pericardial effusion, heart and lung function, wound infection, correct medicine, admission time, readmission frequency, 1 year mortality as well as general function level.



Atrial septal defect - exercise capacity and pulmonary hypertension

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Background: An atrial septal defect (ASD) is categorized as a simple congenital heart disease. For long it was assumed that patients were healthy after their ASD correction. However, recent studies found that ASD patients suffer from increased risks of comorbidities and early death, which is most often due to heart failure. It is speculated that this is secondary to increased pulmonary vascular resistance due to arterial-venous shunting, but the etiology has never been fully studied. The aim of this ongoing case-control study is to determine if ASD patients suffer from decreased exercise capacity, tachyarrhythmias and decreased myocardial contractility due to increased pulmonary vascular pressures. In addition, it is examined if method of closure is of importance on the mentioned parameters.

Methods: ASD patients with closure of their defect are compared with healthy age- and gender-matched controls from the Danish background population. A total of 50 persons will be included; 20 catheter closed and 20 surgically closed ASD patients, and 10 age- and gender-matched controls. Inclusion criteria are: current age > 18 years, age at time of ASD closure > 2 years, and > 3 years since closure. Exclusion criteria are presence of concomitant heart disease, lung disease, ischemic heart diseases, diabetes, hypertension, or valve pathology. Controls are excluded based on the same parameters and if they use prescription drugs interfering with cardiopulmonary function.

The participants are examined using different methods. An echocardiography is performed during rest. Afterwards a right heart catheterization is performed to obtain resting pressure measurements. Participants then perform a cardiopulmonary exercise (CPX) test on a semi-supine bicycle while the Swan-Ganz catheter is still in place. Participants cycle until maximal exhaustion, and every time the workload is increased new echocardiographic images and pressure measurements are acquired. After the CPX test, the participant will receive a 48-hour Holter monitoring

Results: Results are pending.

Persepectives: We aim to clarify the hemodynamic and physiological changes that take place, and thereby shed light on which parameters clinicians should be aware of when dealing with ASD patients. Hopefully this allows us to optimize the course of the disease, which may not be so simple af-ter all.

Preoperative screening for iron-deficiency in vascular patients to reduce blood transfusions

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Background: The prevalence of preoperative anaemia in Danish aortic vascular patients is more than 20%. Preoperative anaemia is independently associated with an increased risk of peri- and postoperative morbidity and mortality. Additionally, preoperative anaemia increases the probability of Red Blood Cell (RBC) transfusions, which is associated to postoperative complications. The “Patient Blood Management” guidelines from the European Community recommend that anaemia should be detected and treated before planned surgery. Yet no hospitals in Denmark, including Aarhus University Hospital, have implemented this. We aim to investigate the effect of treatment preoperatively of iron-deficiency anaemia on RBC transfusions and postoperative mortality and morbidity.

Methods: The first three months, all patients will be screened for anaemia and blood samples will be drawn and ECG's taken during their admission. The following three months all patients will have blood samples drawn in the out-patient clinic, screened for anaemia, have a FATE ultrasound for cardiac dysfunction conducted, an ECG taken, and a spirometry. If either anaemia or cardiac dysfunction is detected, the patient will be either treated or referred or both.

Results: Pending.

Perspectives: If the study shows that the combined intervention is feasible, it will be made permanent and made available to all surgical patients, independent of speciality and procedure, by establishing a preoperative unite, to which all patients planned to undergo procedures at Aarhus University Hospital can be referred.

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