



# Virtual 4th MiECT Symposium

Saturday June 26, 2021  
09:00 - 12:30 EST

Watch live: [www.livemedia.com/4mict](http://www.livemedia.com/4mict)

On behalf of MiECTiS Board of Directors we invite you to actively participate at **Virtual 4<sup>th</sup> MiECT Symposium Global Web Meeting**, which will take place on **Saturday June 26th, 2021 at 09:00-12:30 EST**.

*The event will be broadcasted live by CTSNet.*

**Virtual 4<sup>th</sup> MiECT Symposium** will be an open web meeting from the Society aiming to provide a novel forum for current research by way of abstract presentations and state-of-the-art lectures. Both the abstracts and the lectures will be **asynchronous** with the meeting and available for on-line viewing and comments and questions.

*Registration is free.*

During the live **Virtual 4<sup>th</sup> MiECT Symposium** the presentations will be commented upon and questions and discussions will follow. **There will also be a brief awards presentation for the top 3 abstracts submitted.** The live audience is urged to participate with comments and questions.

We hope this event will contribute to keep active the network that has been formed on MiECT and it will ultimately provide the scientific background for the upcoming 4th MiECT Symposium. We are looking forward to your valuable contribution and we aim for a fruitful and productive web meeting.



**John Murkin**

**President MiECTiS**



# Virtual 4th MiECT Symposium

Saturday June 26, 2021  
09:00 - 12:30 EST

Watch live: [www.livemedia.com/4miect](http://www.livemedia.com/4miect)

## SCIENTIFIC PROGRAM

09:00 –12:30 EST

### time (EST)

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09:00 – 09:05

**Introduction**  
**J. Murkin**

09:05 – 09:45

**Session 1: MiECT State of the Art**  
Moderators: **J. Murkin, A. Kadner**

MiECT – An Overview  
**K. Anastasiadis**

MiECT: Perfusion state of the art  
**P. Starinieri**

MiECT: A Team Approach  
**T. Carrel**

MiECT: Literature Update  
**P. Punjabi**

Modular MiECC  
**P. Antonitsis**



## SCIENTIFIC PROGRAM

time (EST)

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**09:45 – 10:10**

### **Session 2: MiECT, Why, What and How**

Moderator: **A. Liebold, M. Bennett**

MiECT: Surgeon's Perspective

**A. El-Essawi**

MiECT: Anesthesia Perspective

**H. Argiriadou**

MiECT: Concentrating on Safe Perfusion

**C. Serrick**

**10:10 – 10:45**

### **Session 3: Tissue Perfusion During ECC**

Moderators: **C. Ince, J. Murkin**

Molecular Evidence of MiECT on Clinical Outcomes

**S. Gunaydin**

Microcirculation During CPB

**M. O'Neil**

Pulsatility and Tissue Perfusion

**A. Undar**

MiECT and Pulsatility- Are we pulsatile enough?

**M. Hoenicka**

Advanced Brain Monitoring for High-Risk Patients

**J. Murkin**



## SCIENTIFIC PROGRAM

time (EST)

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**10:45 – 11:15**

### **Session 4: MiECT Awareness**

Moderators: **A. Bauer, A. Wahba**

Synergies with ISMICS

**B. Kiaii**

European Board of Cardiovascular Perfusion and MiECT

**F. De Somer**

Synergies with EACTA

**G. Erdoes**

**11:15 – 11:35**

### **Session 5: Abstracts Awards**

Moderators: **C. Serrick, O. Shapira**

**11:35 – 11:55**

### **Session 6: Industry Forum**

Moderator: **H. Jenni**

**M. Van Driel** (Medtronic)

**A. Becker** (Terumo)

**S. Schied** (Maquet)

**11:55 – 12:10**

### **Session 7: COMICS Update**

Moderator: **B. Reeves**

**G. Angelini**

**12:10 – 12:20**

### **Session 8: MiECTiS Business – General Assembly**

Moderator: **P. Antonitsis**

**12:20 – 12:30**

### **Presidential address - Closing Comments**

**J. Murkin**



## FACULTY

**K. Anastasiadis** / Professor of Cardiac Surgery, Cardiothoracic Department, AHEPA University Hospital, Thessaloniki, Greece, Head of the School of Medicine, Aristotle University of Thessaloniki, Executive Board MiECTiS

**G. Angelini** / Professor of Cardiac Surgery, Bristol Heart Institute, United Kingdom, Board of Directors MiECTiS

**P. Antonitsis** / Associate Professor of Cardiac Surgery, Cardiothoracic Department, AHEPA University Hospital, Thessaloniki, Greece, Secretary MiECTiS

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**A. Bauer** / Chief Perfusionist, MediClin Heart Center Coswig, Germany, President German Society for Cardiovascular Engineering

**A. Becker** / Marketing Director Cardiovascular EMEA, Terumo Europe N.V.

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**F. De Somer** / Professor, Clinical Perfusionist, Department of Interventional and Surgical Cardiology, University of Gent, Belgium, President EBCP

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**C. Ince** / Professor, Department of Intensive Care, Laboratory of Translational Intensive Care, Rotterdam, The Netherlands

**H. Jenni** / Clinical Perfusionist, Clinic for Cardiovascular Surgery, University Hospital of Bern, Switzerland



## FACULTY

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**B. Kiaii** / Professor of Cardiac Surgery, Chief of Cardiac Surgery, London Health Sciences, Ontario, Canada, President-Elect ISMICS

**A. Liebold** / Professor of Cardiac Surgery, Department of Cardiothoracic and Vascular Surgery, University of Ulm, Germany, Board of Directors MiECTiS

**J. Murkin** / Professor of Anesthesiology, Director Cardiac Anesthesiology, Department of Anesthesiology and Perioperative Medicine, UWO, London, Ontario, Canada, President MiECTiS

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**S. Schied** / Global Product Manager – Extracorporeal Life Support, Acute Care Therapies, Maquet Cardiopulmonary GmbH, Rastatt

**C. Serrick** / Manager, Perfusion Services and ExVivo Therapies, University Health Network, Toronto, Canada, Vice President MiECTiS

**O. Shapira** / Professor of Cardiothoracic Surgery, Department of Cardiothoracic Surgery, Hadassah Medical Center, Jerusalem, Israel

**P. Starinieri** / Clinical Perfusionist, Jessa Hospital, Hasselt, Belgium, Steering Committee MiECTiS

**A. Undar** / Professor of Pediatrics, Surgery and Biomedical Engineering, PENN State Hershey College of Medicine, Pennsylvania, USA

**M. Van Driel** / Business Director ECT, Medtronic Inc

**A. Wahba** / Professor of Thoracic Surgery, St. Olavs University Hospital, Trondheim, Norway



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## ABSTRACTS

### 01. PROPOFOL PHARMACOKINETICS AND PHARMACODYNAMICS - DURING MINIMALLY INVASIVE EXTRACORPOREAL CIRCULATION (MIECC)

**I. Condello<sup>1</sup>, G. Santarpino<sup>2</sup>, F. Fiore<sup>3</sup>, N. Di Bari<sup>4</sup>, G. Speziale<sup>3</sup>, M. Moscarelli<sup>3</sup>, G. Nasso<sup>3</sup>**

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<sup>3</sup> Cardiac Surgery, Anthea Hospital, Italy

<sup>4</sup> Dipartimento di Emergenza e Trapianti di Organo (D.E.T.O.), Division of Cardiac Surgery, University of Bari, Bari, Italy

**Background:** There is limited evidence as to the pharmacokinetic changes expected in adults with extracorporeal technologies. Drugs may be taken up by various components of the cardiopulmonary bypass circuit itself. Issues include the increased volume of the circuit leading to hemodilution; the sequestration of lipophilic drugs within the circuit tubing; and the absorption of proteins, especially albumin, onto the circuit, which can result in increased free drug. However, in this context, the aspect of pharmacokinetics and pharmacodynamics during minimally invasive extracorporeal circulation has not been described and evidenced by scientific studies.

**Materials and Methods:** In this single-center control study of 100 patients undergoing isolated coronary artery bypass grafting (CABG), we present the results focused on post-operative albumin values and intraoperative propofol dosages in patients undergoing surgery with minimally invasive (n=50) vs conventional extracorporeal circulation (n=50).

**Results:** Static priming volume mean values (mv): 450 ±35 ml (MiECC Group) vs 1250±35ml (cECC group), pvalue 0.022; Lengths of the circuits (mv): 1 m2 (MiECC Group) vs 2.2 m2 (cECC group). The Propofol dosages to achieve a bispectral index of 40–45, (40±5 µg / kg / min) were reported in 30 CABG onMiECC group and (60±9µg / kg / min) in 30 CABG on cECC group, pvalue, 0.016. Post-operative albumin concentrations (after 20 hours) were higher in the MiECC group 4.3 ± 0.4(g / dl) than cECC group, 2.8 ±0.6(g / dl) pvalue 0.005.

**Conclusion:** In the minimally invasive extracorporeal circulation group, a lower propofol dosage titrated to a bispectral index of 40–45 was used during CABG, and an improvement of post-operative concentration of serum albumin was observed compared to the conventional extracorporeal circulation group.





## 02. MAGNETIC LEVITATION PUMP VS CONSTRAINED VORTEX PUMP: A PILOT STUDY ON THE HEMOLYSIS EFFECT DURING MIECC

**I. Condello<sup>1</sup>, G. Santarpino<sup>2</sup>, F. Fiore<sup>1</sup>, G. F Serrano<sup>2</sup>, P. Mastroroberto<sup>2</sup>, A. Fiorentino<sup>3</sup>, G. Speziale<sup>1</sup>, G. Nasso<sup>1</sup>**

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<sup>3</sup> Cardiac Surgery, Città di Lecce, Italy

**Background:** Elevated plasma free hemoglobin is associated with multi-organ injury. In this context, minimally invasive extracorporeal technologies represent a way to reduce this complication following cardiac surgery.

**Materials and Methods:** We present a pilot study focused on plasma free hemoglobin levels in 40 patients undergoing isolated coronary artery bypass grafting. The same circuits for minimally invasive extracorporeal circulation were used in all patients. The ECMOLIFE magnetic levitation pump was used in the study group (n=20), and the AP40Affinity CP centrifugal blood pump was used in the control group (n=20).

**Results:** In the immediate postoperative period, plasma free hemoglobin and lactate dehydrogenase were significantly lower in the study group than in the control group ( $10.6 \pm 0.7$  vs  $19.9 \pm 0.3$  mg/dL,  $p=0.034$ ; and  $99.16 \pm 1.7$  vs  $139.17 \pm 1.5$  IU/L,  $p=0.027$ , respectively). Moreover, patients treated with the magnetic levitation pump showed lower creatinine and indirect bilirubin ( $0.92$  vs  $1.29$  mg/dL,  $p=0.030$  and  $0.6 \pm 0.4$  vs  $1.5 \pm 0.9$  mg/dL,  $p=0.022$ , respectively) at 24 hours after the procedure, and received fewer transfusions during the whole postoperative period (3 vs 9 red blood cell units,  $p=0.017$ ).

**Conclusion:** Our pilot study suggests that the use of magnetically levitated centrifugal pumps for extracorporeal circulation support is associated with a lower risk of hemolysis, though larger studies are warranted to confirm our results.



### 03. MINIMALLY INVASIVE EXTRACORPOREAL CIRCULATION: EFFECTS ON COAGULATION AND PLATELET FUNCTION COMPARED TO OPTIMIZED CONVENTIONAL CARDIOPULMONARY BYPASS

**B. Beairsto<sup>1</sup>, C. Serrick<sup>1</sup>, A. Fernandez<sup>1</sup>, M. Lafreniere-Roula<sup>2</sup>, M. Badiwala<sup>3</sup>, K. Karkouti<sup>4</sup>, V. Rao<sup>3</sup>**

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**Background:** Minimally invasive extracorporeal circulation (MiECC) is employed as a strategy to attenuate the physiologic disturbance caused by cardiopulmonary bypass. The aim of this study was to introduce MiECC at our center and compare to our current standard of care using optimized conventional extracorporeal circulation (CECC). Comparative analysis of blood product usage, platelet function, and rotational thromboelastometry were the primary focus.

**Methods:** Coronary artery bypass grafting operations were performed using MiECC at a single institution. Patients who received CECC in the same period for bypass grafting were used as a control group. Statistical analysis was performed retrospectively.

**Results:** A total of 112 patients were included, with 61 receiving minimally invasive extracorporeal circulation. No difference between groups was observed regarding blood product usage, including red blood cells, plasma, and platelet transfusions. Functional platelet count during the warming phase of cardiopulmonary bypass was found to be higher in the MiECC group ((136 (102-171)  $\times 10^9/L$  vs 109 (94-136)  $\times 10^9/L$ ),  $p=0.027$ ), as were functional platelets as a percent of total platelet count ((86 (77-91) % vs 76 (63-82) %),  $p=0.003$ ). Operative mortality, incidence of stroke, and intensive care unit length of stay showed no difference.

**Conclusion:** Minimally invasive extracorporeal circulation did not confer a statistically significant advantage over optimized conventional extracorporeal circulation with regards to blood product transfusion. Superior preservation of functional platelets is a promising indication for use of MiECC technologies. Following these findings, the intention is to further study MiECC at our center.



#### 04. THE IMPACT OF MINIMALLY INVASIVE EXTRACORPOREAL CIRCULATION ON MYOCARDIAL EDEMA AND MICROVASCULAR INTEGRITY

S. Gunaydin<sup>1</sup>, O. G. Karaca<sup>1</sup>, E. Simsek<sup>2</sup>, E. Kulahcioglu<sup>2</sup>, O. E. Gunertem<sup>3</sup>

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<sup>3</sup> Cardiovascular Surgery, Medical Park Hospital, Ankara, Turkey

**Background:** Endothelial glycocalyx (EG) shedding is accepted to be one of the earliest signs of inadequate myocardial protection due to myocardial edema and inflammatory response. Aquaporine proteins (AQP) form transmembrane channels helping the transfer of water molecules against osmotic gradients. This study aims to compare the effect of minimally invasive extracorporeal (MiECC) vs conventional circuits (CECC) on microcellular integrity and excessive volume handling in CABG patients.

**Methods:** Over a ten-month period, 40 patients (STS Score>8%) undergoing CABG were prospectively randomized to (N=20):

Group 1: MiECC (Type IV, LivaNova)

Group 2: CECC (Inspire 6®, LivaNova)

The expression of AQP4 was analyzed using PCR and serum syndecan-1 levels (biomarker of EG shedding) with monoclonal BB4. Blood samples were collected at baseline (T1), after cessation of CPB and first postoperative day (T3). Transmural myocardial specimens underwent immunoperoxidase staining for AQP-4 and syndecan-1 antibodies.

**Results:** Perioperative data is summarized in Table 1. There is not any significant difference between clinical parameters. Serum syndecan-1 levels were significantly higher at T2 and T3 in CECC group demonstrating microvascular injury and inflammatory response. AQP-4 levels were significantly higher in MiECC group confirming the adequacy of excessive volume handling (Fig1). Fig2 confirms the microscopic outcome via increased cellular injury (well-stained CECC) and bright AQP-4 with increased secretion to overcome volume overload in MiECC.

**Conclusions:** Our data confirms the contribution of MiECC to overcome hemodilution and less inflammatory impact leading to better preservation of cellular function and volume handling versus CECC. Further studies with higher population are warranted.

Figure 1

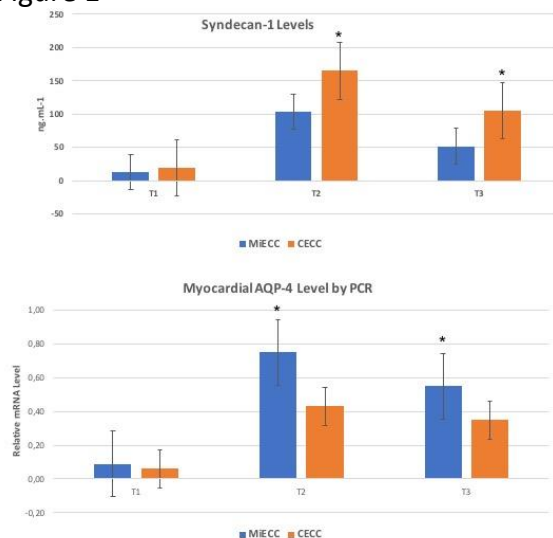
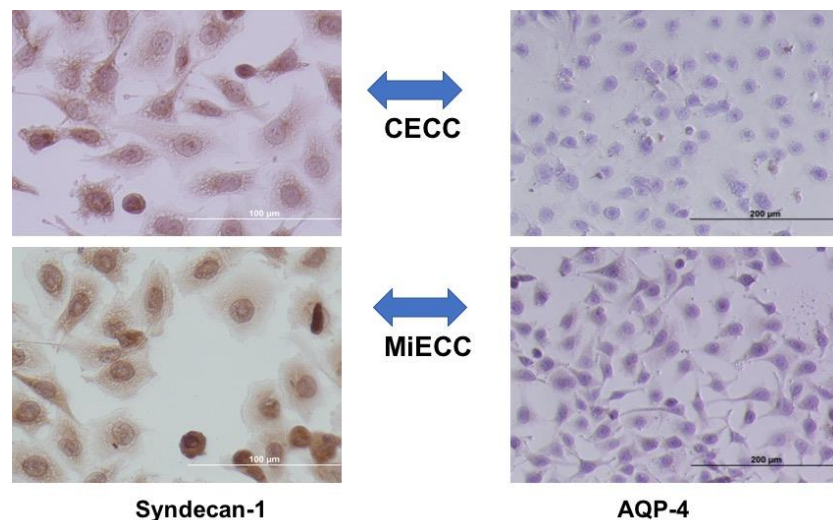




Figure 2



**Table 1:** Perioperative Follow-up

	<b>MiECC (N=20)</b>	<b>CECC(N=20)</b>	<b>p</b>
<b>Age (years)</b>	66±12	69±14	0.9
<b>Male (n)</b>	11	10	0.9
<b>BMI (kg.m<sup>-2</sup>)</b>	1.81±0.2	1.88±0.2	0.6
<b>Preoperative STS Score (%)</b>	8.3±1	8.6±1	0.6
<b>Aortic cross clamp (min)</b>	59±17	65±20	0.09
<b>Troponin-I (ng/mL)- (T2)</b>	11.8±4	12.1±3	0.9
<b>Hemorrhage (mL/24 h)</b>	450±150	550±150	0.7
<b>RBC Transfusion</b>	1.1±0.5	1.3±0.5	0.2
<b>Respiratory Support (h)</b>	5.3±3	7.4±3	0.45
<b>ICU Stay (days)</b>	1.1 (0.5-2.6)	1.6 (0.6-3.2)	0.41
<b>Hospital Stay (days)</b>	5.4 (3.5-6.4)	6.6 (4.9-8.1)	0.56

*BMI: Body mass index; RBC: Red blood cell*



## 05. THE INFLUENCE OF VASOPRESSORS ON VENOUS RETURN DURING CARDIOPULMONARY BYPASS WITH MINIMALLY INVASIVE EXTRACORPOREAL CIRCULATION

**M. Bennett<sup>1</sup>, C. Lloyd<sup>2</sup>, M. Weatherall<sup>3</sup>, G. Webb<sup>3</sup>**

<sup>1</sup> Morriston Hospital, Swansea Bay University Health Board, Swansea, UK

<sup>2</sup> Cardiac Surgery, Derriford Hospital, Plymouth, UK

<sup>3</sup> Clinical Perfusion, Derriford Hospital, Plymouth, UK

**Background:** Kinetic-assisted venous drainage used in MiECC circuits may be limited by vena caval collapse and can generate negative venous line pressures, with the potential to elicit gaseous micro emboli. A study of venous cannulae with different designs concluded that the cannula design cannot, of itself, significantly improve the rate of venous return to better meet target flows. Because fluid replacement can significantly improve venous return, albeit with the disadvantage of haemodilution, we hypothesised that increasing the tone of the systemic vascular compartment might significantly augment venous return while avoiding haemodilution or blood transfusion.

**Methods:** We searched our database for cases performed with a MiECC circuit and where the responsible anaesthetist had started a low dose pressor infusion prior to cardiopulmonary bypass. We compared this 'Pressor' group with 'Standard' MiECC patients.

**Results:** CPB duration was shorter in the Pressor group. Hb, oxygen saturation and PaO<sub>2</sub> were the same, but the average flow was higher in the Pressor group, and this resulted in a higher average oxygen delivery. The negative pressure was less negative overall and the duration of pressures less than -60mmHg were significantly shorter in the Pressor group. Peak plasma lactate was higher in the Standard group.

**Conclusions:** The addition of a continuous infusion of a low dose pressor agent during cardiopulmonary bypass with a MiECC circuit significantly improves the flow characteristics of the circuit, increases the oxygen delivery and reduces the incidence of hyperlactaemia during bypass.





## 06. ARE THERE ANY SAFETY ISSUES DURING CARDIAC SURGERY WITH MINIMALLY INVASIVE EXTRACORPOREAL CIRCULATION? A SYSTEMATIC REVIEW OF THE LITERATURE

K. Anastasiadis, P. Antonitsis, C. Asteriou, A. Deliopoulos, H. Argiriadou

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**Background:** Despite extensive available evidence that shows clinical superiority of MiECC, worldwide penetration remains low due to concerns, mainly raised by perfusionists, regarding prompt handling of unexpected intraoperative scenarios in the context of a closed system. The purpose of this study is to thoroughly investigate perfusion safety and technical feasibility of performing cardiac surgery with MiECC aiming to ultimately clarify whether there are any issues regarding MiECC technology.

**Methods:** A systematic review of the literature was conducted following the PRISMA guidelines. Moreover, data from major conference proceedings were screened. All reported critical perfusion issues associated with MiECC were collected. Moreover, relation to clinical outcome was also investigated. In studies involving use of modular MiECC the rate and cause of conversion to open circuit was recorded and quantitative synthesis of data was performed. Risk of bias was assessed for each study.

**Results:** One-hundred and twenty-three manuscripts were assessed for eligibility after reading full-text, of which 14 studies were included in the qualitative synthesis. Safety of the procedure was challenged by a single small series which reported air entrainment in a type I MiECC, while no clinical adverse event related to MiECC use was identified. Studies involving modular MiECC reported 100% technical feasibility; the quantitative synthesis revealed a cumulative conversion rate of 2%.

**Conclusions:** Systematic review of the literature identified literally no safety issues during cardiac surgery on MiECC. Use of contemporary modular MiECC ultimately eliminates any perfusion concerns regarding air handling and volume management, while it overcomes any unexpected intraoperative scenario.



## **07. MINIMAL INVASIVE EXTRACORPOREAL CIRCULATION PRESERVES COAGULATION INTEGRITY AFTER CARDIAC SURGERY**

**H. Argiriadou, P. Antonitsis, A. Gkiouliava, E. Papapostolou, A. Deliopoulos, K. Anastasiadis**

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**Background:** Coagulopathy after cardiac surgery is a serious multifactorial complication; use of cardiopulmonary bypass represents the major contributing factor. We sought to investigate the effect of contemporary minimal invasive extracorporeal circulation (MiECC) on coagulation parameters using point-of-care (POC) testing and the relation to postoperative bleeding and transfusion requirements.

**Methods:** Patients undergoing elective cardiac surgery on MiECC were prospectively recruited. Anticoagulation strategy was based on individualized heparin management and heparin level-guided protamine titration. Rotational thromboelastometry and impedance aggregometry testing was performed before induction of anesthesia and after aortic cross-clamp release. A strict POC-guided transfusion protocol was implemented.

**Results:** Thirty-five patients were included in the study with a significant proportion having complex surgery. Eight patients (23%) required blood transfusion (mean rate:  $0.4 \pm 0.8$  units per patient), 3/35 (9%) received coagulation factors while no patient received fresh frozen plasma, platelets or fibrinogen transfusion. The vast majority of patients (74%) were assigned to bleeding class 0. Thromboelastometry analysis showed that the only derangement was CT EXTEM > 100 s observed in 18/35 (51%) patients after cross-clamp release without relation to postoperative bleeding. Despite the reduction in absolute platelet concentration, platelet function was protected throughout surgery. ADPtest value was preserved ( $60 \pm 19$  vs.  $59 \pm 18$  U;  $p=0.7$ ) while TRAPtest was found significantly increased ( $87 \pm 30$  vs.  $110 \pm 41$  U;  $p<0.01$ ) during surgery on MiECC.

**Conclusions:** MiECC preserves clot quality throughout surgery acting in both key determinants of clot strength; fibrinogen and platelets. This is clinically translated into minimal postoperative bleeding resulting in restricted use of blood products and coagulation factors.



## 08. IMPLEMENTATION OF MINIMALLY INVASIVE EXTRACORPOREAL CIRCULATION SYSTEM IN MINIMALLY INVASIVE AORTIC VALVE SURGERY: RESULTS FROM 156 PATIENTS

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<sup>5</sup> Cardiac Anaesthesia and Intensive Care Unit, Lancisi Cardiovascular Center, Ancona, Italy

**Background:** Minimally invasive extracorporeal circulation (MiECC) systems were introduced to minimize cardiopulmonary bypass-related systemic adverse effects. Although MiECC was associated with improved results in coronary surgery, the impact of such a technology in heart valve surgery remains unclear. Here we report our results in a cohort of patients undergoing minimally invasive aortic valve replacement (MI-AVR) using MiECC.

**Methods:** Data from 156 consecutive patients underwent isolated MI-AVR using type IV MiECC system between 2016 and 2021, were prospectively collected. The median age of the study population was 75 (IQR: 68-80) years and the median EuroSCORE II was 1.32% (IQR: 0.88-2). All procedures were performed through upper ministernotomy and central cannulation for MiECC institution. Ultra fast track anaesthetic management with table extubation was used in 81 (52.6%) patients.

**Results:** Overall 30-day mortality was 0.6% (n=1), and no stroke occurred. Main postoperative complications were bleeding (n=1, 0.6%) and temporary dialysis (n=1, 0.6%). The median operative transfusions of red blood cells was 0 units (IQR: 0-1) with 108 patients (69.2%) requiring no transfusion. Median intensive care unit and hospital stay were 24 hours (22-46) and 6 days (5-8), respectively.

**Conclusions:** Our results showed that MiECC system can be implemented safely in MI-AVR interventions and was associated with very low mortality and morbidity rates. We believe MiECC system should be considered a fundamental component of modern MI-AVR approaches as by reducing the surgical injury and promoting faster recovery, it may further valorize less invasive interventions.



## 09. A 10-YEAR EXPERIENCE OF THE USE OF THE LEVITRONIX CENTRIMAG SHORT TERM VENTRICULAR ASSIST DEVICE BEYOND 30-DAYS

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<sup>2</sup>Department of Cardiothoracic Anaesthesia and Intensive Care, Golden Jubilee National Hospital

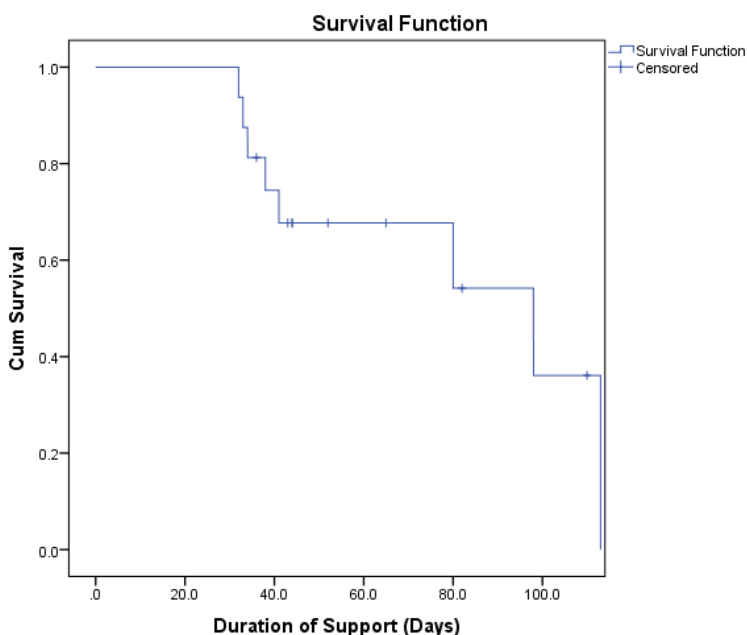
<sup>3</sup>Scottish National Advanced Heart Failure Service, Golden Jubilee National Hospital

**Introduction:** Short-term ventricular assist devices (STVAD) are used as bridging therapy in patients with cardiogenic shock from refractory heart failure. Extracorporeal membranous oxygenation (ECMO) is usually the initial therapy of choice, although its use in the mid term is often limited by the complications associated with poor left ventricle unloading and thromboembolic sequelae. There is a paucity of data regarding the use of STVADs beyond 30 days in the literature.

**Methods:** Retrospective analysis of all patients who underwent STVAD implantation at the national referral centre and remained on STVAD support beyond 30 days from 2010-2020. A time to event analysis was conducted.

**Results:** 80 patients received STVADs at our centre during the study period. Overall survival following bridging therapy was 53.8%. 16 patients required ongoing STVAD support beyond 30 days. 8 patients (50%) had dilated cardiomyopathy, 4 (25%) ischaemic cardiomyopathy, 3 (19%) myocarditis and 1(6%) arrhythmogenic right ventricular non-compaction. 12 (67%) had BIVAD implantation with 6(33%) LVADs. Median age of the patients was 39.5 (31-49). 11 (68.8%) patients were male. Median duration of support was 44 days (38-81 days) and the longest duration of support was 113 days. 7 (44%) patients were successfully transplanted, 8(50%) died from a complication of the support and 1 (6%) patient was successfully explanted. A cerebrovascular was the terminal event in 5 patients (31%) with an intraabdominal bleed accounting for the remaining 3 (19%) deaths.

**Conclusion:** STVADs support beyond 30 days is feasible with similar survival compared to the presenting cohort but has a significant burden on healthcare resources. Vigilance is needed for prevention of complications.





## 10. COMPARISON OF OPTICAL MONITORING OF CEREBRAL AUTOREGULATION INDEX USING NEAR-INFRARED SPECTROSCOPY AND DIFFUSE CORRELATION SPECTROSCOPY IN PATIENTS UNDERGOING CARDIOPULMONARY BYPASS

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**Background:** Cerebral autoregulation is often impaired in patients undergoing cardiopulmonary bypass (CPB)<sup>1</sup>. Near-infrared spectroscopy (NIRS) has been used to assess cerebral autoregulation (CA) during adult cardiac surgery<sup>2</sup>. Advanced optical techniques now enable diffuse correlation spectroscopy (DCS) to detect changes in CBFa. This provides a completely new means to assess CA<sup>3</sup>. In this study, we aimed to assess the comparability of compare real-time CA monitoring using DCS with that of NIRS.

**Methods:** After REB approval, seven adult cardiac surgical patients were monitored intraoperatively with DCS and bNIRS devices. CBF index (CBFi) was calculated as a moving, linear correlation coefficient between CBF derived from DCS and mean arterial blood pressure (MAP) over a 5-minute interval<sup>2</sup>. The cerebral oximetry (COXi) was determined in a similar fashion correlating MAP against NIRS. Intact CA(CAi) was defined by CBFi and COXi  $\leq 0.4$ .

**Results:** 2122 paired CA-values were obtained from 7 patients. As shown in Figure, CBFi and COXi showed significant correlation (Spearman correlation coefficient: 0.54,  $P < 0.0001$ ) and good agreement (bias: 0.07, 95% limits of agreement: -0.91 to 1.04). Importantly, good agreement in detection of preserved or impaired autoregulation was shown between two indices (Kappa: 0.44,  $p < 0.0001$ ). The agreement largely unchanged from pre-CPB, on-CPB and off-CPB. Impaired autoregulation was found in 5 patients before CPB and 4 during CPB.

**Conclusions:** The feasibility of using DCS or NIRS to determine CAi was shown, demonstrating good agreement between these 2 methods in adult patients undergoing CPB and suggesting various optical methods can detect CAi in the setting of heart surgery.

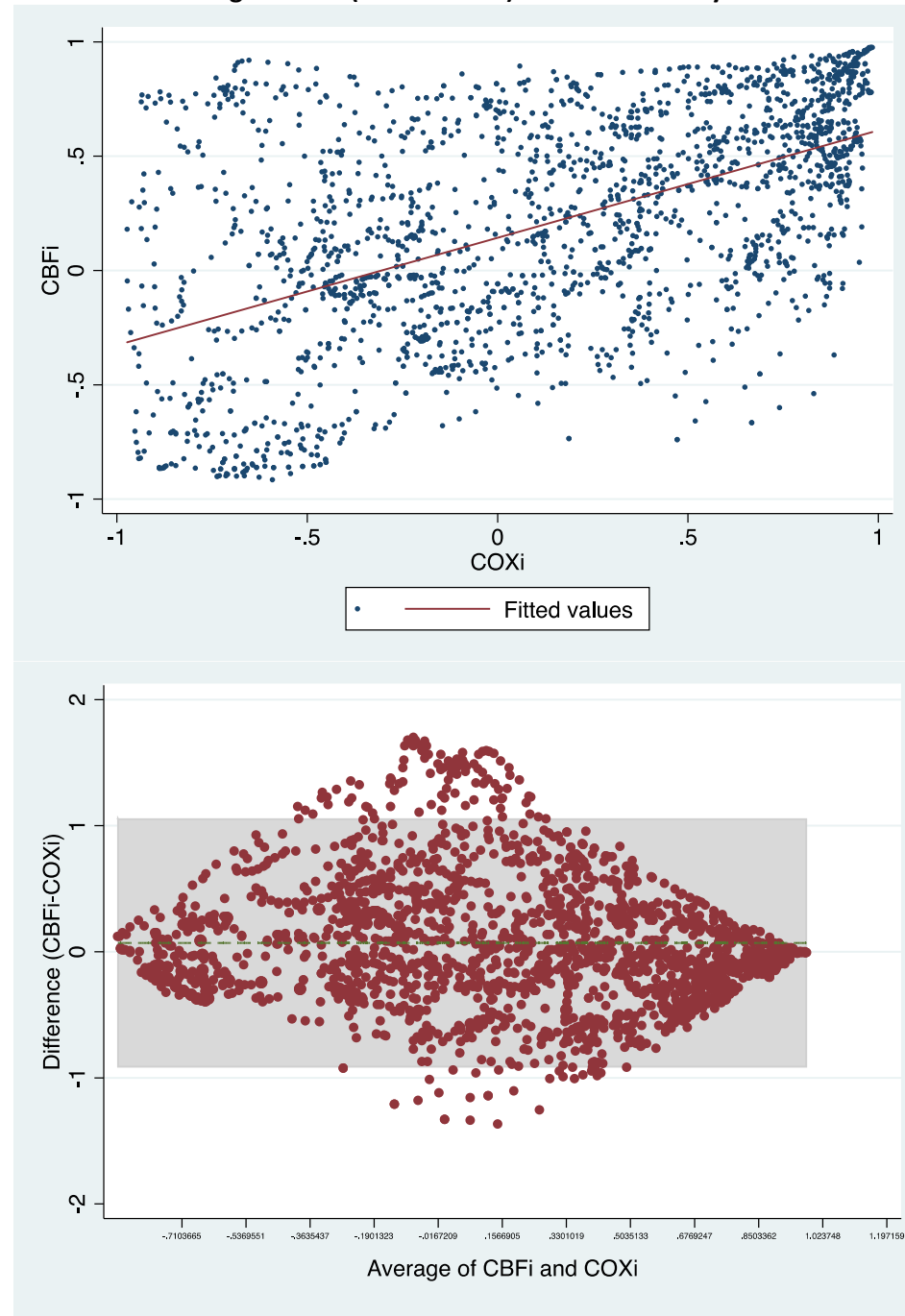
[1] Murkin JM et al. Anesth Analg 1987;66:825

[2] Murkin JM et al. J Cardiothorac and Vasc. Anesth., 2015;5:1187

[3] Rajaram et al. Biomed Optics Express 2020;11:5967



**Figure.** Average CBFi and COXi values obtained during CPB were compared by linear regression ( $\beta=0.47$ ,  $p<0.0001$ ) (A); and the Bland-Altman method (B). The dashed lines represent bias (0.07) and the 95% limits of agreement (-0.91 to 1.05) for the bias analysis.





## 11. IDENTIFICATION OF A UNIQUE INDEX OF BRAIN PROTECTION USING OPTICAL MONITORING OF CEREBRAL FLOW-METABOLISM COUPLING DURING CARDIOPULMONARY BYPASS

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**Background:** Mean arterial pressure (MAP) target ranges are used to maintain adequate cerebral blood flow (CBF) in patients undergoing cardiac surgery with cardiopulmonary bypass (CPB). Conventional MAP targets do not consider cerebral autoregulation (CA) variability, or impairment between patients<sup>1</sup>. Prolonged periods of low CPB flow or low MAP can lead to decreased CBF, impaired cerebral metabolism, and neuronal damage<sup>2</sup>. Maintenance of CBF and cerebral oxidative metabolism via intact CA is crucial to prevent severe neurological complications following CPB.

**Methods:** A novel hybrid optical system that combines diffuse correlation spectroscopy (DCS) with broadband near-infrared spectroscopy (bNIRS) was used to continuously monitor CBFindex, the oxidation state of cytochrome c oxidase (oxCCO) – a direct marker of oxidative metabolism, and cerebral saturation (ScO<sub>2</sub>) during cardiac surgery. Changes in oxCCO and CBFi were evaluated during intraoperative hypoperfusion episodes attending transient clinical reductions in CPB flow and MAP.

**Results:** All seven adult cardiac surgical patients undergoing CPB were monitored successfully using oxCCO and CBFi. A unique observation, that during transient hypoperfusion oxCCO remained stable for a variable time until CBF fell by more than 60%, was made.

**Conclusions:** This demonstrates the feasibility of the hybrid optical system to provide a unique Critical Ischemic Threshold index (CITi) based on the interval between onset of hypoperfusion and subsequent decrease in oxCCO. The CITi may become an important measure to reduce the incidence of neurological complications associated with CPB.

1. Murkin JM et al, J CardiothoracVasc Anesth, 2015;5:1187
2. Murkin JM et al, J Thorac Cardiovasc Surg 1995;110:349