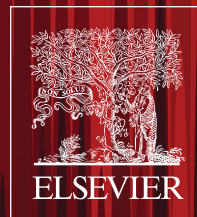


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EACTAIC-ICCVA 2021 Joint Virtual Congress Abstracts

Edited by  
Gianluca Paternoster

Journal of Cardiothoracic and Vascular Anesthesia

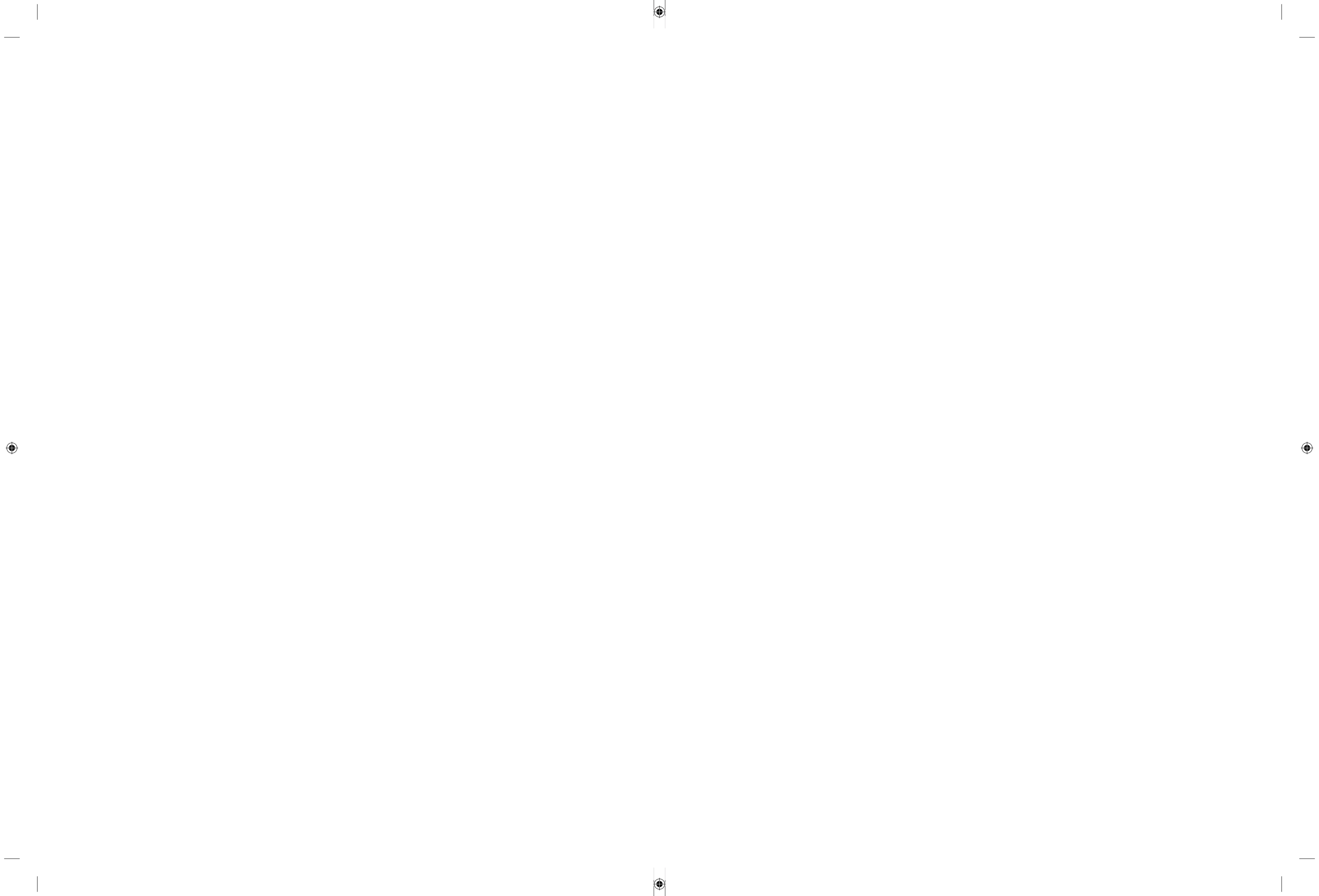
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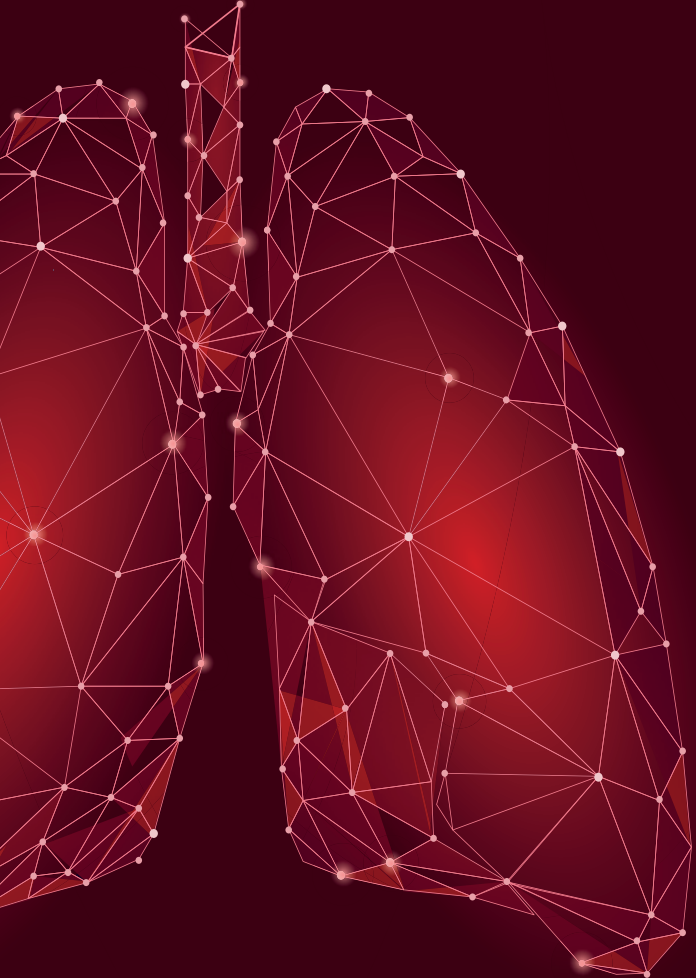
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The abstracts published in this issue have not been corrected for spelling or grammar.

The investigators of these abstracts have stated in their submission letter that prospective studies where patients are involved have Ethics Committee approval and informed patient consent, and that the studies using experimental animal have institutional approval.

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### *Welcome message*

Dear Colleagues,

We are delighted to virtually welcome you to this important virtual educational event which represents a Joint EACTAIC and SCA collaboration.

Also this year, being 100% digital, will allow EACTAIC 2021 to go more sustainable and green! Last year Annual Congress edition was a very tiring and challenging one, but it was also a year in which Science gave a great contribution to all of us.

Therefore, in this period of great uncertainty, it is important to virtually-meet again this year to talk about our science progress and experiences.

We selected an exciting and stimulating scientific programme, where international experts and researchers from all over the world will deliver talks and share science achievements and new projects

Wishing you the best of health and looking forward to connecting with you for this new outstanding edition.

The Congress Chairs

*Fabio Guarracino – EACTAIC President*

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# Journal of Cardiothoracic and Vascular Anesthesia

VOL 35S1

OCTOBER 2021 SUPPLEMENT

## CONTENTS

**Committee  
Welcome address**

vi  
vii

### ABSTRACTS

### ORAL PRESENTATIONS

#### **ECHO Panel Session: The right way forward: significance of echocardiography of the right – October 27, 2021**

- CO:01** THE IMPACT OF PRESSURE RECOVERY ADJUSTMENT ON AORTIC VALVE AREA DISEASE SEVERITY IN TRANSCATHETER AORTIC VALVE REPLACEMENT PATIENTS  
*Renan Ferrufino, Luis Gonzalez-Ciccarelli, Alfadhel Alfadhel, Claudia Bruguera, Sadeq Quraishi, Jamel Ortoleva, Ethan Brovman, Charles Resor, Frederick Cobey, Jennifer A. Smith* **S1**

#### **VASCULAR Panel Session: Pre-and intraoperative management of the vascular patient – October 27, 2021**

- CO:02** THE ANESTHETIC MANAGEMENT OF EXTENSIVE AORTIC THORACIC ANEURYSM REPAIR WITH CLAMSHELL INCISION  
*Ana Lidia Rouxinol, Mariana Fernandes, Cláudia Almeida* **S2**

#### **Congenital Panel Session: Shaping the future of pediatric congenital heart surgery – October 27, 2021**

- CO:03** ASSESSMENT OF MICROCIRCULATION BY A VASCULAR OCCLUSION TEST USING NEAR-INFRARED SPECTROSCOPY AFTER ANESTHESIA INDUCTION IN PEDIATRIC CARDIAC SURGERY  
*Omer Savluk, Yasemin Yavuz, Fatma Ukil Isildak* **S3**

#### **CPB Panel Session: Hot topics in CPB – October 27, 2021**

- CO:04** INFLUENCE OF RESPIRATORY SUPPORT STRATEGY DURING CARDIOPULMONARY BYPASS ON LUNGS OXYGENATING FUNCTION  
*Aleksandr Kirillov, Andrey Yavorovskiy, Irina Mandel, Margarita Vyzhigina, Roman Komarov, Pavel Nogtev, Pavel Bagdasarov, Elena Khalikova, Yuri Podolskiy, Aleksandr Panov, Sofia Kazakova, Timur Kasim* **S4**

(Continued)

## CONTENTS

(Continued)

### TRANSPLANT&VAD Panel Session: LVAD implantation October 27, 2021

- CO:05** PERSUADE SURVEY - PERIOPERATIVE ANESTHESIA AND INTENSIVE CARE MANAGEMENT OF VENTRICULAR ASSIST DEVICE IMPLANTATION IN EUROPE  
*Maren Kummerow, Vera Von Dossow, Daniela Pasero, Blanca Martinez, Nandor Marczin, Eric De Waal* **S4**

### Opening Ceremony Session – October 27, 2021

- CO:06** PULMONARY ARTERY TO AORTA RATIO AS PREOPERATIVE PREDICTOR FOR SEVERE RIGHT HEART FAILURE POST LEFT VENTRICULAR ASSIST DEVICE IMPLANTATION  
*Renan Ferrufino Rosales, Abdulaziz Alfadhel, Luis Gonzalez-Ciccarelli, Brian Gebhardt, Jamel Ortoleva, Masashi Kawabori, Frederick Cobey* **S5**

### Plenary Joint Session: COVID-19 – October 27, 2021

- CO:07** COVID-19 PANDEMIC EXPERIENCE IN THE UNITED KINGDOM – A NATIONAL SURVEY ABOUT CARDIAC CASES, WORK PATTERNS OF CARDIAC ANAESTHETISTS AND SUPPORT  
*Thomas Gilbey, Ben Milne, Gudrun Kunst* **S6**

### ECHO Panel Session: HOCM Testing? – October 27, 2021

- CO:08** CORRELATION OF MITRAL ANNULAR PLANE SYSTOLIC EXCURSION (MAPSE) WITH LEFT VENTRICULAR GLOBAL LONGITUDINAL STRAIN (GLS) IN PATIENTS UNDERGOING CORONARY ARTERY BYPASS SURGERY  
*Deepak Borde, Balaji Asegaonkar, Joshi Shreedhar* **S7**

### Thoracic Panel Session – October 27, 2021

- CO:09** A COMPARISON OF ISOLATION AND SPONTANEOUS VENTILATION FOR LUNG MANAGEMENT DURING THORACIC SURGERY: A SYSTEMATIC REVIEW AND META-ANALYSIS  
*Eve Wilson, Peter Alston* **S8**

### Vascular Panel Session – October 27, 2021

- CO:10** BLOOD AND COAGULATION PRODUCT DISPOSAL IN THE MODERN ERA - A SURVEY AND REVIEW OF CURRENT PRACTICE  
*Daniel Gerber, Gabor Erdös* **S9**

### CPB Symposium: Difficult weaning from cardiopulmonary bypass – October 27, 2021

- CO:11** PRESERVATION OF RENAL ENDOTHELIAL INTEGRITY AND REDUCION OF RENAL EDEMA BY APROTININ DOES NOT PRESERVE RENAL PERFUSION AND FUNCTION FOLLOWING EXPERIMENTAL CARDIOPULMONARY BYPASS  
*Nicole Dekker, Aniek Van Leeuwen, Matijs Van Meurs, Jill Moser, Jeannette Pankras, Nicole Van Der Wel, Hans Niessen, Marc Vervloet, Alexander Vonk, Peter Hordijk, Christa Boer, Charissa Van Den Brom* **S10**

### ICU Panel Session 1 – October 28, 2021

- CO:12** THE EFFECT OF GOAL-DIRECTED FLUID THERAPY ON THE OCCUR OF ACUTE KIDNEY INJURY IN PATIENTS UNDERGONE CARDIAC SURGERY  
*Imge Ozdemir, Tulun Ozturk, Dilsad Amanvermez Senarlan, Funda Nizamoglu Yildirim* **S11**

(Continued)

## CONTENTS

(Continued)

### Haemostasis Panel Session: Clotting blood – October 28, 2021

- CO:13** INTRAOPERATIVE VALIDITY OF POINT OF CARE DURING PARTIAL HEPARIN NEUTRALIZATION  
*Bérénice Tiquet, Franck Pihan, Marius Tifrea, Andreea Tifrea, Michel Denizou, Philippe Thomasset, Isabelle Orsel, Jean Philippe Marsaud, Jérôme Jouan, David Vandroux* **S12**

### TRANSPLANT&VAD Panel Session 2: Lung Transplantation – October 28, 2021

- CO:14** PREDICTION OF DYSPNOEA FOLLOWING LUNG RESECTION SURGERY: POST-HOC ANALYSIS OF 'PROFILES' STUDY  
*Brian Lafferty, Philip McCall, Adam Glass, Jonathan Silversides, Prabodh Sasidharan, Robbie Lendrum, Benjamin Shelley* **S12**

### Thoracic Panel Session : New Challenges For 2021 – October 28, 2021

- CO:15** ENDOBRONCHIAL INTUBATION WITH THE KING VISION® AND MCGRATH® LARYNGOSCOPES IN SIMULATED EASY AND DIFFICULT AIRWAYS BY NOVICES (EKINGMATH)  
*Alaa Khidr, Jumana Masoudi, Sarah Alaboud, Mashaal Alshahrani, Aziza Bokhari, Massimiliano Sorbello, Mohamed Khalil, Saeed Al Shadowy, Talal Al Ghamdi, Summayah Fallatah, Mohamed El Tahan* **S13**

### Plenary Joint Session ERACS: Optimizing care in cardiac surgery – October 28, 2021

- CO:16** THE IMPORTANCE OF THYROID HORMONE LEVELS AFTER HEART SURGERY – PRELIMINARY STUDY  
*Balázs Szécsi, Ádám Nagy, Ákos Balog, János Gál, Béla Merkely, Andrea Székely* **S14**

### ECHO Panel session: 3D\* ECHO PANEL – October 28, 2021

- CO:17** AN UNEXPECTED INTRAOPERATIVE UNUSUAL CASE OF AORTIC STENOSIS  
*Pietro Bertini, Gianluca Paternoster, Giulia Brizzi, Andrea Colli, Giosuè Falcetta, Michele Celiento, Fabio Guarracino* **S15**

### Congenital Panel Session: VAD & Extracorporeal life support – October 28, 2021

- CO:18** NEAR-INFRARED SPECTROSCOPY FOR MONITORING DISTAL LIMB PERFUSION DURING PEDIATRIC MINIMAL INVASIVE CARDIAC SURGERY FOR CONGENITAL HEART DEFECTS  
*Jigisha Sachde* **S16**

### ECHO Panel Session: To Be Or Not To Be: decision making in perioperative echocardiography – October 29, 2021

- CO:19** INTRAOPERATIVE DIAGNOSIS WITH TRANSESOPHAGEAL ECHOCARDIOGRAPHY OF LARGE THROMBUS IN THE VEIN CAVA INFERIOR DURING REMOVAL OF VENO-ARTERIAL EXTRACORPOREAL MEMBRANE OXYGENATION DURING POSTOPERATIVE CARE OF CARDIAC TRANSPLANTATION  
*Carlos Chamorro Falero, Manuel Bertomell Cornejo, Juan Jose Morales Domene, Isabel Maria Ramos Arroyo* **S17**

### ICU Panel Session 2: Rhythmic problems in cardiothoracic ICU – October 29, 2021

- CO:20** DEXMEDETOMIDINE IN CARDIAC SURGERY: JUDGE, JURY AND EXECUTIONER A FREQUENCY OF BRADYARRHYTHMIAS AND ATRIOVENTRICULAR BLOCKS IN CARDIAC SURGERY  
*Andres Beltran-Rios, German Franco-Gruntorad, Laura Ramirez-Herrera, Yimi Santana-Rodriguez, Hugo Mantilla-Gutierrez* **S18**

(Continued)

## CONTENTS

(Continued)

### Haemostasis Panel Session 2: Masterclass workshop Transfusion & Haemostasis – October 29, 2021

- CO:21** COMBINED PLATELET AND ERYTHROCYTE SALVAGE DURING ON-PUMP CARDIAC SURGERY USING SAME™ BY I-SEP AUTOTRANSFUSION DEVICE: INTERIM ANALYSIS OF THE I-TRANSEP STUDY  
*Alexandre Mansour, Antoine Beurton, Anne Godier, Bertrand Rozec, Cécile Degryse, Bernard Chollet, Fabienne Nedelec-Gac, Pascale Gaussem, Mathieu Fiore, Elodie Boissier, Nicolas Nesseler, Alexandre Ouattara* **S19**

### Plenary Joint Session ERATS: Optimizing care in thoracic surgery – October 29, 2021

- CO:22** ANATOMICAL INNERVATION AND PHARMACOLOGY OF INTERFASCIAL PLANE REGIONAL ANALGESIA FOR THORACIC SURGERY AND TRAUMA  
*Claudia Preston, Beatrice Howland-Jackson, Toby Kileen, Ellie Rowbotham, Ruth Ou, Adam O'connor, Johnny Soe-Paing, Rebecca Jarrott, Hector Crosbie, Naiya Aza, Peter Alston* **S20**

### Closing Ceremony Session- October 29, 2021

- CO:23** MITOCHONDRIAL OXYGENATION DURING CARDIOPULMONARY BYPASS: A PILOT STUDY  
*Calvin De Wijs, Rinse Ubbink, Max Ligtenberg, Maarten Ter Horst, Egbert Mik, Floor Harms* **S20**

### POSTER PRESENTATIONS

- PP:01** OPIOID-FREE ANESTHESIA IN CORONARY ARTERY BYPASS GRAFTING (CABG) SURGERY, DURING A DRUG SHORTAGES PERIOD IN THE COVID 19 PANDEMIC  
*Hans Fred García Araque, Luisa Fernanda Cepeda Pinzón, Oscar Andrés Quintero Beltrán, Jaime Alberto Barros Campo* **S22**
- PP:02** EFFECTS OF PERIOPERATIVE GLYCEMIC VARIABILITY ON POSTOPERATIVE ACUTE KIDNEY INJURY AFTER OFF-PUMP CORONARY ARTERY BYPASS GRAFTING: A SINGLE-CENTER RETROSPECTIVE STUDY  
*Yuan He, Hongqi Lin, Hongdang Xu* **S23**
- PP:03** MANAGEMENT OF TYPE A DISSECTION IN PREGNANCY: SITE AND TEAM CAN MAKE THE DIFFERENCE  
*Dimitrios Korfiotis, Giulia Gambino, Sara Leonard* **S24**
- PP:04** THE ROLE OF HIGH FIDELITY CARDIOVASCULAR SIMULATION IN ANESTHESIA TRAINING  
*Sigrid Lambrecht, Libera Fresiello, Marc Van De Velde, Elke Van Gerven, Layth Al Tmimi* **S24**
- PP:05** CARDIOTHORACIC ANAESTHESIA LECTURE SERIES  
*Eustacia Hamilton, Mike Adamson, Caroline Evans* **S25**
- PP:06** THE INFLUENCE OF ANTIPLATELET MEDICATIONS ON INTRAOPERATIVE PATIENT BLOOD MANAGEMENT DURING ADULT CARDIAC SURGERY  
*Ahmed Abdelaatti, Sophie Shinnors, Aneurin Moorthy, Abdelrahman Mohammed, Niamh Barnwell, John MacHale* **S26**
- PP:07** APROTININ USE IN CARDIAC SURGERY IN A TERTIARY CENTRE IN IRELAND: CASE NUMBERS, INDICATIONS & COMPARISON TO TRANEXAMIC ACID  
*Gillian Cotter, Colm Keane* **S26**
- PP:08** DEXMEDETOMIDINE IN CARDIAC SURGERY  
*German Franco, Andres Beltran, Yimi Santana, Laura Ramirez, Hugo Mantilla* **S27**

(Continued)

## CONTENTS

(Continued)

- PP:09** IS THE SWAN-GANZ CATHETER EXCLUSIVELY A TOOL FOR PRESSURE MEASUREMENTS INSIDE THE PULMONARY CIRCULATION? THE MECHANICAL CONTRIBUTION OF THE PULMONARY ARTERY CATHETER TO A CRITICAL DECISION MAKING INTRAOPERATIVELY  
*Konstantinos Lolakos, Nikolaos Tsotsolis, Antonios Pitsis, Nikolaos Nikoloudakis, Anda-Cristina Butnar, Timotheos Kelpis, Isaak Keremidis* **S28**
- PP:10** APROTININ USE IN HIGH-RISK CARDIAC SURGERY: RECENT INSIGHTS FROM THE BELGIAN APROTININ PATIENT REGISTRY  
*Stefaan Bouchez, Carla Van Gompel, Guy Schols, Patrick Lecomte, Koen Lapage, Stefan Rb Jacobs, Jan Poelaert, Steffen Rex* **S29**
- PP:11** EFFECTS OF ULTRASOUND-GUIDED BILATERAL THORACIC PARAVERTEBRAL NERVE BLOCK COMBINED WITH GENERAL ANESTHESIA ON BRIDGING VASCULAR FLOW IN OFF-PUMP CORONARY ARTERY BYPASS GRAFTING: A SINGLE-CENTER RANDOMIZED CONTROLLED STUDY  
*Hongdang Xu, Hongqi Lin* **S29**
- PP:12** ANESTHESIA MANAGEMENT OF PATIENTS UNDERGOING PERCUTANEOUS PULMONARY VALVE IMPLANTATION  
*Hongdang Xu, Hongqi Lin* **S30**
- PP:13** PERIOPERATIVE ANTIBIOTIC PROPHYLAXIS IN CARDIAC SURGERY. WHAT SHOULD WE KNOW?  
*Cristian Palau Martí, Fernando Pascual De La Fuente, Eva María Mateo Rodríguez, Susana Moliner Velázquez, Manuel Granell Gil, José De Andrés Ibáñez, Óscar Gil Alvarova* **S31**
- PP:14** IS A HIGH HEMATOCRIT USEFUL TO REVEAL AN EARLY REEXPANSION PULMONARY EDEMA?  
*Francesco Greco, Pasquale Raimondo, Matteo Melchionda, Nicola Di Bari* **S32**
- PP:15** THROMBECTOMY FOR ACUTE EMBOLIC STROKE FOLLOWING HEART SURGERY  
*Cameron Semple, Peter Alston* **S33**
- PP:16** WHOLE BODY PERFUSION STRATEGY FOR AORTIC ARCH REPAIR UNDER NORMOTHERMIA AND BEATING HEART TECHNIQUE IN PEDIATRIC PATIENTS. THREE CLINICAL CASES  
*Alexey Svalov, Evgeny Tarasov, Olga Alexandrova, Andrey Tyulpin, Evgeny Zakharov, Konstantin Kazantsev, Dmitriy Bodrov* **S33**
- PP:17** CASE SERIES OF SEVERE ACCIDENTAL HYPOTHERMIC CARDIAC ARREST TREATED SUCCESSFULLY WITH CARDIOPULMONARY BYPASS IN A UNIVERSITY HOSPITAL IN UNITED KINGDOM  
*Juneenath Karattuparambil, Vasanth Ramachandran, Prabhjoyt Kler, Arun Govindaswamy* **S34**
- PP:18** WHOLE BODY NORMOTHERMIC PERFUSION STRATEGY FOR AORTIC REPAIR IN ADOLESCENT WITH CHRONIC AORTIC DISSECTION  
*Alexey Svalov, Evgeny Tarasov, Olga Alexandrova, Andrey Tyulpin, Evgeny Zakharov, Konstantin Kazantsev, Dmitiy Bodrov* **S35**
- PP:19** A HOLISTIC LUNG RECRUITMENT TECHNIQUE IN PEDIATRIC PATIENTS WITH CONGENITAL HEART DISEASES  
*Jigisha Sachde, Guriqbal Singh* **S35**
- PP:20** APROTININ INHIBITS THROMBIN GENERATION BY THE INTRINSIC PATHWAY OF COAGULATION, BUT IS NOT A DIRECT THROMBIN INHIBITOR  
*Ton Lisman, Jelle Adelmeijer, Dana Huskens, Joost Meijers* **S36**
- PP:21** PREOPERATIVE ANAEMIA AND BLOOD TRANSFUSION IN CARDIO-THORACIC SURGERY: A SINGLE CENTRE RETROSPECTIVE AUDIT  
*Juneenath Karattuparambil, Palanisamy Matheswaran, Shashank Dhannhiganaahalli, Arun Govindaswamy* **S37**

(Continued)



## CONTENTS

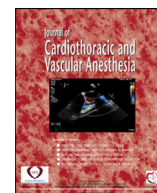
(Continued)

<b>PP:22</b>	INTERPRETATION OF PLATELET MAPPING: IS IT GRAPH IMPORTANT <i>Juneenath Karattuparambil, Ravish Jeeji, Krishna Pasupuleti</i>	<b>S37</b>
<b>PP:23</b>	COMBINED TREATMENT WITH IGM ENRICHED IMMONOGLOBULIN AND CYTOSORB IN INFECTIVE ENDOCARDITIS: CASE SERIES <i>Gianluca Paternoster, Pietro Bertini, Sabino Scolletta, Francesco Franchi, Fabio Guarracino</i>	<b>S38</b>
<b>PP:24</b>	OUTCOMES RELATED TO VENOUS TO ARTERIAL CARBON DIOXIDE GAP AND PERFUSION PARAMETERS IN PATIENTS UNDERGOING VENO-ARTERIAL EXTRACORPOREAL MEMBRANE OXIGENATION <i>Juan Sebastian Montoya-Beltran, Maria Paula Giraldo-Restrepo, German Andres Franco-Gruntorad, Carlos Miguel Santacruz</i>	<b>S39</b>
<b>PP:25</b>	INTRAOPERATIVE MANAGEMENT OF A NEWBORN WITH COR TRIATRIUM DEXTRUM: A CHALLENGING CASE <i>Elise André, Geoffroy De Beco, Alain Poncelet, Karlien Carbonez, Madelien Barbier, Mona Momeni</i>	<b>S39</b>
<b>PP:26</b>	PATIENT PERIOPERATIVE EXPERIENCE AT ST. BARTHOLOMEW'S DURING THE COVID-19 PANDEMIC <i>Sarra Wang, Adenike Odeleye, Sue Body, Amieth Yogarajah</i>	<b>S40</b>
<b>PP:27</b>	EARLY POSTOPERATIVE SERUM OSMOLARITY IMBALANCE MAY PREDICT WORSE SHORT-TERM MORTALITY AFTER HEART TRANSPLANTATION IN ADULTS <i>Andras Szabo, Dominika Szabo, Krisztina Toth, Balazs Szecsi, Anges Sandor, Csaba Eke, Rita Szentgroti, Boglar Parkanyi, Andras Denes, Andrea Szekely</i>	<b>S41</b>
<b>PP:28</b>	ANAESTHESIA FOR THORACOSCOPIC THYMECTOMY IN MYASTHENIA GRAVIS: A NON-MUSCLE-RELAXANT TECHNIQUE <i>Juneenath Karattuparambil, Ranjit Bains, Arun Govindaswamy</i>	<b>S41</b>
<b>PP:29</b>	THE ASSOCIATION BETWEEN PREOPERATIVE AND POSTOPERATIVE HEPATIC VENOUS FLOW AND THE OUTCOME AFTER CARDIAC SURGERY <i>Csaba Eke, András Szabó, András Dénes, Andrea Székely</i>	<b>S42</b>
<b>PP:30</b>	AORTIC STENOSIS IN A COMPLEX CASE OF MAJOR VASCULAR SURGERY <i>Purificación Matute, Marc Giménez-Milà, Cristina Ibañez, Gaspar Mestres, Xavier Yugueros, Irene Rovira</i>	<b>S43</b>
	<b>Author Index</b>	<b>S44</b>



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## Journal of Cardiothoracic and Vascular Anesthesia

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## EACTAIC-ICCVA Joint Congress

## ORAL

**ECHO Panel Session: The right way forward: significance of echocardiography of the right – October 27, 2021  
CO:01**

**THE IMPACT OF PRESSURE RECOVERY ADJUSTMENT ON AORTIC VALVE AREA DISEASE SEVERITY IN TRANSCATHETER AORTIC VALVE REPLACEMENT PATIENTS**

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**Introduction:** Pressure recovery (PR) in aortic stenosis (AS) occurrence has been studied since the late 1980's as specific cases applicable only to small or low-normal ranges aortas. [1] Interest regarding PR has increased significantly in recent years. [2-3] The aim of our study is to determine the impact of PR adjustment on disease severity in patients with severe AS by traditional grading methods. We hypothesize that accounting for PR will result in a reclassification of aortic stenosis severity in a significant number of patients.

	Severe AS after PR adjustment (n=435)		Moderate AS after PR adjustment (n =109)		p- value
	Mean	sd	Mean	sd	
<b>Demographics</b>					
Age, year	81	8.6	78.2	11.2	<b>0.006</b>
Sex, male (%)	226 (51.95%)		58 (53.21%)		<b>&lt; 0.001</b>
BSA, m2	1.8	0.2	1.9	0.2	<b>&lt; 0.001</b>
<b>Echocardiographic Parameters</b>					
EF	54.5		57.4	10.9	<b>0.022</b>
EF > 50%	344 (70.08%)		91 (83.48%)		<b>0.047</b>
Peak Velocity	4.0	0.9	3.8	0.8	<b>&lt; 0.001</b>
Mean Pressure Gradient	40.7	14.5	35.8	12.3	<b>&lt; 0.001</b>
AVA	0.7	0.3	0.9	0	<b>&lt; 0.001</b>
AVA PR	0.8	0.4	1	0.1	<b>&lt; 0.001</b>
Change in AVA after PR	0.08	0.03	0.15	0.04	<b>&lt; 0.001</b>
AVAI	0.4	0.1	0.5	0.1	<b>&lt; 0.001</b>
AVAI PR	0.4	0.2	0.5	0.1	<b>&lt; 0.001</b>
Change in AVAI after PR	0.04	0.02	0.08	0.02	<b>&lt; 0.001</b>
PR	12.6	5.1	14.4	6	<b>0.002</b>
<b>CT Measurements</b>					
STJ diameter, cm	2.8	0.4	2.8	0.3	<b>0.978</b>
STJ diameter, < 2.4 cm	71		15		<b>0.829</b>
STJ diameter, 2.5 - 2.9 cm	220		58		<b>0.248</b>
STJ diameter, 3.0 - 3.4 cm	126		31		<b>0.793</b>
STJ diameter, > 3.5 cm	18		5		<b>0.403</b>

**Methods:** After institutional board approval, we performed a retrospective single center study on patients who underwent TAVR at Tufts Medical center between October 2012 to February 2021. Standard measurements and mean transaortic gradients were obtained by pre-procedure transthoracic echocardiograms. Aortic valve areas (AVA) were calculated using the continuity equation. PR and PR adjusted AVA were calculated using previously validated equations. [4-5] Sinotubular junction (STJ) size was obtained from pre-procedural computerized tomography (CT) scans.

**Results:** Patient characteristics are shown in Table 1. A total of 544 patients were evaluated after excluding patients greater than mild mitral or aortic regurgitation. The absolute value of pressure PR recovery was significantly different between the reclassified groups. (p-value = 0.02) Using PR adjusted AVA resulted in the reclassification of 109 patients (25.05%) from severe to moderate aortic stenosis (AVA >1 cm<sup>2</sup>). Of the 109 patients who were reclassified, 36 patients (33.02%) had STJ diameters >3.0 cm. (Table 1)

**Discussion:** Adjusting calculated AVA for PR resulted in a reclassification of a significant number of adult patients from severe to moderate aortic stenosis. PR was significantly larger in patients who reclassified from severe to moderate aortic stenosis after adjusting for PR. There was no difference in STJ diameter between the PR adjusted groups. Our data suggests that those patients most vulnerable to reclassification with PR adjustment are those with the largest calculated “severe” aortic valve areas, rather than those with particular aortic root dimensions.

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**VASCULAR Panel Session: Pre-and intraoperative management of the vascular patient – October 27, 2021**  
CO:02

**THE ANESTHETIC MANAGEMENT OF EXTENSIVE AORTIC THORACIC ANEURYSM REPAIR WITH CLAM-SHELL INCISION**

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**Introduction:** Surgical repair of extensive thoracic aorta disease represents an interesting challenge, both surgical and anesthetic. We describe the surgical repair of an acute aortic dissection beginning in the aortic arch in relation with aortic coarctation and a post coarctation aneurism, and the aspects related to planning, management and perioperative care.

The clamshell incision is associated with respiratory complications, bleeding and post-operative severe pain. Interruption of spinal cord blood supply is one of the causes of spinal cord injury after thoracic aortic aneurism repair. Aortic arch surgery requiring circulatory arrest bears significant risk of brain injury.

**Methods:** Descending aorta cannulation and perfusion, preservation of its posterior wall, lumbar paravertebral NIRS and femoral arterial invasive pressure monitoring were used as spinal cord protective strategies. Cerebral antegrade perfusion, initially unilateral and then bilateral, with BIS and cerebral NIRS monitoring were the key components of the cerebral protection strategy.

A bilateral erector spinae plane block (BESPB) was performed to allow good pain control in the postoperative period, early extubation and rehabilitation. Intravenous antifibrinolytic, goal directed transfusion therapy and maintaining a coagulation friendly environment were the mainstays of the non-surgical hemostasis strategy.

**Results:** The patient was successfully extubated in the operating room presenting no neurological deficits. The surgical drains were removed on the fifth day; on the following day it was necessary to surgically remove part of the left thoracic drain, under combined anesthesia with the ipsilateral ESPB catheter. The remaining postoperative period was uneventful and the patient was discharged home in the 10th postoperative day.

**Discussion:** No subarachnoid catheter was placed (to drain cerebrospinal fluid to protect the spinal cord from ischemia), after discussing it in advance with the surgical team, given the risks associated with it and the protective strategy to be adopted: direct perfusion of the descending aorta, preservation of its posterior wall, lumbar paravertebral NIRS and femoral arterial invasive pressure monitoring, in the intraoperative period, on table extubation and direct neurological monitoring, together with adequate systemic arterial pressures, in the immediate postoperative period. Good pain control with BESPB and on table extubation allowed for early rehabilitation

**References:** 1. Assessing the Benefits of Preoperative Thoracic Epidural Placement for Lung Transplantation. *Journal of Cardiothoracic and Vascular Anesthesia* Vol. 32 Issue 6

2. Spinal Cord Protection in Elective Thoracoabdominal Aortic Procedures. *Journal of Cardiothoracic and Vascular Anesthesia* Vol. 33 Issue 1

3. Brain Protection in Aortic Arch Surgery: An Evolving Field. Journal of Cardiothoracic and Vascular Anesthesia Vol. 35 Issue 4

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### Congenital Panel Session: Shaping the future of pediatric congenital heart surgery – October 27, 2021

CO:03

#### ASSESSMENT OF MICROCIRCULATION BY A VASCULAR OCCLUSION TEST USING NEAR-INFRARED SPECTROSCOPY AFTER ANESTHESIA INDUCTION IN PEDIATRIC CARDIAC SURGERY

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**Introduction:** In cardiac surgery, anesthesia induction causes significant haemodynamic changes. However, haemodynamic management routinely uses blood pressure and cardiac output targets, and this is supported by blood analyses but for this rarely employs microvascular monitoring [1]. However, macrohaemodynamics management following cardiac surgery is limited in predicting the microcirculation [2]. The microcirculation can be assessed by the use of vascular occlusion testing (VOT)[3]. NIRS is an easily applicable, non-invasive method for assessing tissue oxygenation and microvascular reactivity [4]. The aim of our study was to evaluate the effects of anesthesia induction on microvascular reactivity using VOT.

	Before induction	After induction	P
Baseline StO <sub>2</sub> (%)	78,8±1,4	85,1±1,1	0,03
Minimum StO <sub>2</sub> (%)	54,80±17,3	66,64±13,2	0,001
Occlusion slope (%/min)	0,22±0,1	0,16±0,07	0,001
Maximum StO <sub>2</sub> (%)	87,12±11,6	89,25±9,63	0,001
Reperfusion slope (%/min)	1,82±1,16	1,27±0,98	0,001
Reperfusion time (min)	22,4±10,2	28,7±20,1	0,001

**Methods:** Prior to induction of anaesthesia, we performed the first VOT with NIRS. Thereafter, all patients received a standardised anaesthesia induction with fentanyl (5 mcg/kg), rocuronium (1 mg/kg), midazolam (0,1 mg/kg). Then, tracheal

intubation, positive pressure ventilation was started to maintain end-tidal CO<sub>2</sub> tension of 30-35 mmHg. Maintenance of anaesthesia was performed using intermittent midazolam, fentanyl, and rocuronium. The second VOT was performed 20 min after induction of anaesthesia (before skin incision). Comparisons of data before and after induction were made by using the paired samples t test.

**Results:** VOT variables before and after induction of anaesthesia are shown in Table . Baseline StO<sub>2</sub> was higher after induction of anaesthesia (78,8 vs. 85,1%, P=0.03). Oxygen consumption was significantly lower after induction, as indicated by the higher minimum StO<sub>2</sub> (54,8 vs. 66,6 % p=0.001) and the slower occlusion slope (0,22 vs. 0,16 p=0,001). After induction of anaesthesia, reperfusion time was significantly longer (22,4 vs. 28,7) and reperfusion slope was significantly slower (1,82 vs. 1,27 p=0,001).

**Discussion:** In our study of pediatric cardiac surgery patients, significant microcirculatory alterations were observed after induction of anaesthesia. The clinical evaluation of microcirculatory reactivity seems to be of great interest, but currently its assessment is considered technically challenging. Among a variety of non-invasive techniques, NIRS coupled with VOT has been proposed to be an easy-to-perform and reliable tool to assess microvascular reactivity[4]. The occlusion slope reflects oxygen consumption in the tissue; thus, a slower occlusion rate indicates lower metabolic rate, impaired regional perfusion distribution or impairment in oxygen utilisation by mitochondria. After reperfusion, previously closed capillaries favourably open and blood flow in previously patent capillaries increases, causing a hyperaemic response. Thus, a slower reperfusion slope and a diminished degree of flow reperfusion indicate impaired microvascular reactivity[5].

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## CPB Panel Session: Hot topics in CPB – October 27, 2021 CO:04

### INFLUENCE OF RESPIRATORY SUPPORT STRATEGY DURING CARDIOPULMONARY BYPASS ON LUNGS OXYGENATING FUNCTION

Aleksandr Kirillov\*, Andrey Yavorovskiy, Irina Mandel, Margarita Vyzhigina, Roman Komarov, Pavel Nogtev, Pavel Bagdasarov, Elena Khalikova, Yuri Podolskiy, Aleksandr Panov, Sofia Kazakova, Timur Kasim

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**Introduction:** There are high incidence of pulmonary complications and acute respiratory failure (3,2—28,6%)<sup>1</sup> after cardiac surgery with cardiopulmonary bypass. The study aimed to evaluate the effectiveness of various tactics of respiratory support during cardiopulmonary bypass (CPB) for the prevention of postoperative pulmonary complications.

**Methods:** This is a prospective, randomized, controlled clinical study in parallel groups. The study was approved by a local ethics committee. Informed consent was obligatory for all participants. Sixty patients were divided into two groups. In group 1 we provided a continuous positive airway pressure (CPAP) of +5 cm H<sub>2</sub>O during CPB. In group 2 patients underwent mechanical ventilation with reduced volume (volume control (VC) mode, tidal volume 3 ml / kg of ideal body weight) and respiratory rate of 6 breathes per minute with positive end-expiratory pressure + 5 cm H<sub>2</sub>O. The primary end-point of the study was the value of the partial pressure of oxygen in arterial blood to oxygen fraction in inhaled gas mixture ratio (paO<sub>2</sub>/FiO<sub>2</sub>) at different stages of perioperative management: T1 (after the beginning of mechanical ventilation, T2 (before the CPB), T3 (after CPB), T4 (at the end of the surgery), T5 (upon admission to the ICU), T6 and T7 (6 and 12 hours after surgery, respectively). Secondary end-points were the common lung complications rate (pneumonia, pleural effusion, atelectasis, pneumothorax), the frequency of recruitment maneuvers during the mechanical ventilation, the need for non-invasive ventilation after extubation, the frequency of re-intubation of the trachea. Statistical analysis was carried out in SPSS for Mac v19 (IBM, Inc, USA). Data were presented as mean (±standard deviation) or number (percent). A comparison of the quantitative characteristics was performed using the Mann Whitney U-test. Fisher's exact test was used for the incidence of complications between groups. A p value of less than 0.05 was considered statistically significant.

**Results:** The results are presented in Tables 1 and 2.

**Table 1 - Dynamics of the oxygenation index at different stages of the operation**

Group	paO <sub>2</sub> /FiO <sub>2</sub> after induction to anesthesia	paO <sub>2</sub> /FiO <sub>2</sub> before CPB	paO <sub>2</sub> /FiO <sub>2</sub> after CPB	paO <sub>2</sub> /FiO <sub>2</sub> at the end of the surgery	paO <sub>2</sub> /FiO <sub>2</sub> at admission to the ICU	paO <sub>2</sub> /FiO <sub>2</sub> at 6 hours after surgery	paO <sub>2</sub> /FiO <sub>2</sub> at 12 hours after surgery
CPAP, n=30	319.3 ±80	319.4 ±57	223.1 ±152	275.2 ±90	324 ±116	319.6 ±61	326.8 ±60
VC, n=30	331.4 ±55	333.1 ±65	289.6 ±100	318.7 ±74	321.9 ±69	330.5 ±62	337.7 ±70
p value	0.49	0.38	0.05	0.045	0.93	0.5	0.517

paO<sub>2</sub>/FiO<sub>2</sub> - partial pressure of oxygen in arterial blood to oxygen fraction in inhaled gas mixture ratio; CPB - cardiopulmonary bypass; ICU - intensive care unit; CPB - cardiopulmonary bypass; CPAP - continuous positive airway pressure; VC - volume control.

**Table 2 - Pulmonary complications, n=60.**

Indicators	CPAP, n=30	VC, n=30	P value
Total number of pulmonary complications	27	15	
Atelectasis	11 (36.6%)	3 (10%)	<0.05
Pneumonia	2 (6.6%)	2 (6.6%)	>0.05
Pleural effusion	12 (40%)	8 (26%)	>0.05
Pneumothorax	2 (6.6%)	2 (6.6%)	>0.05

CPAP - continuous positive airway pressure; VC - volume control.

The paO<sub>2</sub>/FiO<sub>2</sub> in the VC group was higher than in the CPAP group at stages T3 and T5. The frequency of recruiting maneuvers in the VC group was lower than in the CPAP group. There was a lower incidence of atelectasis in the VC group than in the CPAP group (Table 2).

The low-volume lung ventilation during the CPB is beneficial for oxygenating function of the lungs in comparison with CPAP respiratory support.

**Discussion:** The low-volume lung ventilation during the CPB is beneficial for oxygenating function of the lungs in comparison with CPAP respiratory support.

**References:** 1. Eremenko A.A, Zyulyaeva T.P. Postoperative acute respiratory failure in cardiac surgery. Pirogov Russian Journal of Surgery = Khirurgiya. Zurnal im. N.I. Pirogova. 2019;8:5-11. (In Russ.). <https://doi.org/10.17116/hirurgia20190815>

## TRANSPLANT&VAD Panel Session: LVAD implantation October 27, 2021 CO:05

### PERSUADE SURVEY - PERIOPERATIVE ANESTHESIA AND INTENSIVE CARE MANAGEMENT OF VENTRICULAR ASSIST DEVICE IMPLANTATION IN EUROPE

Maren Kummerow<sup>1\*</sup>, Vera Von Dossow<sup>2</sup>, Daniela Pasero<sup>3</sup>, Blanca Martinez<sup>4</sup>, Nandor Marczin<sup>5</sup>, Eric De Waal<sup>6</sup>

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**Introduction:** The PERSUADE survey was designed to explore real world practices for anaesthesia and intensive care management during left ventricular assist device (LVAD) implantation in European cardiac centres.

**Methods:** Of 202 European LVAD centres invited to participate, 91 centres expressed an initial interest and received a link to the survey, which targeted information regarding 1) institutional organisation and experience, 2) hemodynamic monitoring, 3) inotropic and medical management and 4) postoperative intensive care aspects.

**Results:** Seventy-four European centres from 23 countries completed the survey (response rate 36.6%). Most LVAD implantations were performed in university hospitals (n = 55, 74.3%). 50% of the centres had 10-20-year experience with at least 10 implantations (n = 45, 60.8%) in 2019.

Extended hemodynamic monitoring included: CVP (n=67, 90.5%), pulmonary artery catheter (PAC) (n=64, 86.5%), CCO (n=42, 56.8%), TEE (n=74, 100%), NIRS (n=56, 75.7%) and BIS-index (n=44, 59.5%).

First choice induction agents were propofol (n=31, 43.2%), etomidate (n=24, 32.4%) and midazolam (n=11, 14.9%), and sufentanil (n=39, 52.7%) and fentanyl (n=23, 31.1%).

Hemodynamic parameters used to define right ventricular (RV) failure were: CVP (n=52, 70.3%), MPAP-CVP gradient (n=25, 33.8%), CVP/PCWP ratio (n=25, 33.8%) and RVSWI (n=22, 29.7%), while TEE parameters used were eyeballing (n=52, 70.3%), TAPSE<16 mm (n=38, 51.4%), RVEDD-LVEDD ratio>1.0 (n=26, 35.1%), interatrial septum constantly bowing (n=41, 55.4%), hypovolemic left atrium and ventricle (n=11, 14.9%), dilated right atrium and ventricle (n=41, 55.4%) and inferior vena cava collapsibility (n=4, 5.4%).

Primary inotropic support before induction consisted of dobutamine (n=45, 60.8%), levosimendan (n=40, 54.1%), norepinephrine (n=30, 40.5%), and PDE3-inhibitors (n=28, 37.8%), or a combination. Prophylactic inotropic support prior to extracorporeal circulation included: continuation of preoperative inotropic support (n=25, 33.8%), norepinephrine (n=35, 47.3%), dobutamine (n=30, 40.5%), epinephrine (n=29, 39.2%), PDE3-inhibitors (n=26, 35.1%), levosimendan (n=13, 17.6%) and NO (n=8, 10.8%). If RV-function worsened during weaning from extracorporeal circulation, the primary therapeutic strategy was change in

inotropes (n=44, 59.5%), RVAD implantation (n=13, 17.6%), ECMO (n=10, 13.5%) or use of NO (n=5, 6.8%).

Vasoplegia was monitored by a combination of parameters: clinical judgement (n=32, 43.2%), use of norepinephrine>100 ng/kg/min (n=43, 58.1%), MAP<50 mmHg (n=36, 48.6%) and SVR<800 dynes/sec/cm<sup>5</sup> (n=40, 54.1%) for several hours.

The estimated postoperative complication rate was 27.5% for vasoplegia, 10% for RV-failure requiring mechanical circulatory support, 20% for developing renal failure requiring renal replacement therapy and 5% for gastrointestinal bleeding. Two thirds of the centres started anticoagulation on the day of LVAD implantation, with preference of intravenous heparin (n= 69, 93.2%).

**Discussion:** These data demonstrate that the majority of LVAD implantations were performed by an experienced team of surgeons and anaesthesiologists at university hospitals. There was sizeable practice variation in the choice of induction, maintenance, and inotropic agents. In particular only the minority of hospitals utilized inhaled NO therapy. While all centres employed TEE monitoring, PAC was less universal and only half of the centres used continuous hemodynamic monitoring. Finally, various parameters were used to define RV-failure or vasoplegia. These findings demonstrate the need for international consensus to guide perioperative monitoring and pharmacological support.

## Opening Ceremony Session – October 27, 2021

### CO:06

#### PULMONARY ARTERY TO AORTA RATIO AS PREOPERATIVE PREDICTOR FOR SEVERE RIGHT HEART FAILURE POST LEFT VENTRICULAR ASSIST DEVICE IMPLANTATION

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**Introduction:** Right ventricular failure (RVF) remains as critical complications in durable LVAD patients. Avoiding severe RVF is essential especially in increasing destination LVAD patients because they have no exit strategies. An enlarged pulmonary artery (PA) and an increased pulmonary artery/aorta (PA/Ao) diameter ratio are associated with increased pulmonary artery pressure (PAP).(1) Previous studies have indicated that PA/Ao ratio, as assessed on computed tomography (CT), may be a useful diagnostic tool for pulmonary hypertension severity, in patients with COPD, and group 1 pulmonary

hypertension.(2-3) However, the clinical significance of preoperative PA/Ao in right ventricular failure (RVF) after durable left ventricular assist device (LVAD) implantation has not been examined. We sought to investigate the prognostic impact of preoperative PA/Ao diameter ratio in durable LVAD patients with severe postoperative RVF.

**Methods:** (Following IRB approval,) we performed a single center retrospective study of patients receiving a durable LVAD between March 2013 and July 2019. RVF was categorized by non-severe and severe based on the INTERMACS criteria. The cohort were divided into severe RVF vs non-severe RVF. The aim of the study was to analyze the effect of preoperative PA/Ao diameter ratio to postoperative RVF. Also, receiver operating characteristics curve (ROC) and logistic regression model were utilized to sub-analyze the prediction quality and cut-off value of PA/Ao to severe RVF.

**Results:** Among total of 219 cohort, 43 were excluded for unavailable hemodynamic data or CT scan, the remaining 176 were included and analyzed. Among 176 cohort, 44 (25.0%) developed severe RVF. Preoperative patient demographics, hemodynamics and CT findings are shown in Table 1. Severe RVF group had statistically larger preoperative PA diameter ( $P=0.05$ ), smaller Ao diameter ( $P=0.02$ ), and larger PA/Ao ( $P<0.01$ ) compared to non-severe RVF group. Preoperative PVR, TPG, DPG were similar between 2 groups. ROC curve testing PA/Ao ratio's diagnostic ability to predict severe RVF, with an area under the curve result of 0.787. (Figure 1), Logistic regression curve predicted probability gives a cutoff point of 1.09. (Figure 2)

**Discussion:** Our study showed PA/Ao diameter ratio is an easy noninvasive indicator with satisfactory diagnostic ability to predict postoperative severe RVF with cutoff value of 1.09. This non-invasive assessment could be more utilized in clinical decision making such as patient selection, preoperative optimization and timing of surgery to avoid postoperative severe RVF. A larger data set should focus on mortality effect and examine in more depth the relationship between PA/Ao ratio and PVR.

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	n (total)	Non-Severe RVF n = 132	Severe RVF n = 44	p-value
Age	176	57.1 ± 11.8	56.2 ± 11.3	0.591
BSA	176	2.06 ± 0.26	2.35 ± 3.26	0.060
BMI	176	28.74 ± 14.77	28.11 ± 5.43	0.500
Male gender	176	111 (84.1%)	41 (93.2%)	0.128
<b>CT Scan</b>				
PA (mm)	176	28.88 ± 4.46	30.34 ± 5.38	<b>0.050</b>
Aorta (mm)	176	31.53 ± 4.62	29.47 ± 5.63	<b>0.020</b>
PA to Ao ratio	176	0.92 ± 0.11	1.04 ± 0.12	<b>&lt; 0.001</b>
PVR	176	3.84 ± 1.86	3.71 ± 1.85	0.710
TPG	176	14.22 ± 5.20	14.77 ± 8.49	0.391
DPG	176	4.19 ± 3.91	4.68 ± 5.02	0.910

RVF: right ventricular failure, n: number, BSA: body surface area, BMI: body mass index, CT: computerized tomography, PA: pulmonary artery, Ao: aorta, mm: millimeters, PVR: pulmonary vascular resistance, TPG: trans-pulmonary gradient, DPG: diastolic pulmonary gradient

Figure 1. Area Under the Curve  
Test Result Variable PA/Aorta ratio – Severe RVF: 0.787

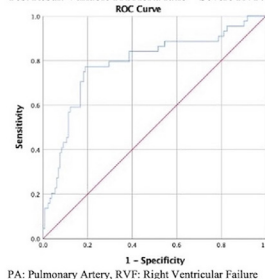
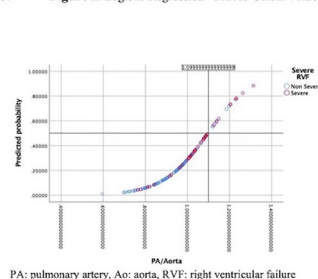


Figure 2. Logistic Regression - PA/Ao Cutoff Value



## Plenary Joint Session: COVID-19 – October 27, 2021 CO:07

### COVID-19 PANDEMIC EXPERIENCE IN THE UNITED KINGDOM – A NATIONAL SURVEY ABOUT CARDIAC CASES, WORK PATTERNS OF CARDIAC ANAESTHETISTS AND SUPPORT

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**Introduction:** The COVID-19 pandemic started in Hubei Province, China in 2019 with the first confirmed cases in the UK in January 2020. On May 21st 2020, there were 158,488 confirmed cases in England and Wales with 33,081 deaths in SARS-CoV-2 positive patients (1). From March 2020 onwards, emergency cardiac operations were prioritised and individual work patterns adjusted. The skill set of cardiac anaesthetists, often including an expertise in critical care medicine, extracorporeal membrane oxygenation and echocardiography, was useful for the multidisciplinary medical care of COVID-19 patients in critical care units. The aim of this survey was to assess individual cardiac anaesthetic experiences during the first wave of the COVID-19 pandemic in the UK.



**Methods:** We conducted a survey, supported by the Association for Cardiothoracic Anaesthesia and Critical Care (ACTACC). A 16-question survey related to the first UK COVID-19 surge in April and May 2020 was sent to the membership of ACTACC in 36 cardiac centres in July 2020. Data was collected and collated using the web-based survey platform “Survey Monkey” (Palo Alto, CA).

**Results:** There were 80 completed responses, indicating a response rate of about 20%. The majority of anaesthetists continued cardiac anaesthesia with emergency cases (53%) and urgent cases (65%) only at their centres. Every 5th cardiac anaesthetist (22%) was re-deployed to a different unit in their hospital or to a different hospital. The clinical work pattern changed at least moderately for the majority of cardiac anaesthetists (86%). The majority of anaesthetists (90%) felt appropriately supported when they stepped outside of their usual clinical role during the pandemic and 95% felt that their existing skillset was appropriately used. The workload increased in a majority of cardiac anaesthetists (53%), but it also decreased for some (35%). Non-resident on-calls increased for about 1/3 (36%) of respondents and resident on-calls increased for 50% of cardiac anaesthetists. A majority of anaesthetists (85%) wore PPE during their clinical work and 95% felt that the supply of PPE was adequate. The most useful source of information during the pandemic was peer discussion, chosen by more than half of cardiac anaesthetists (54%).

**Discussion:** The results of this national survey for cardiac anaesthetists during the first COVID-19 wave in the UK demonstrate that work patterns for cardiac anaesthetists changed dramatically. These changes may have an effect on psychological wellbeing of cardiac anaesthetists (2). However, the majority of anaesthetists felt well supported in their clinical work. Peer discussions scored high as useful sources of information, suggesting that professional networks are crucial to both, personal wellbeing and good patient care. One limitation of this survey is a low response rate, with potentially more extreme experiences in the non-responder group, emphasising the importance of support measures and the challenge of gauging that they are effective.

We conclude, that with subsequent COVID-19 peaks, there is a continued need to address potential effects of major changes of work patterns by cardiac anaesthetists on burnout, psychological wellbeing and resilience.

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**ECHO Panel Session: HOCM Testing? – October 27, 2021  
CO:08**

### **CORRELATION OF MITRAL ANNULAR PLANE SYSTOLIC EXCURSION (MAPSE) WITH LEFT VENTRICULAR GLOBAL LONGITUDINAL STRAIN (GLS) IN PATIENTS UNDERGOING CORONARY ARTERY BYPASS SURGERY**

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<sup>2</sup>Cardiac Anesthesia, Narayana Institute of Cardiac Sciences, Bengaluru, Karnataka, India

**Introduction:** Introduction: Global longitudinal strain (GLS) of left ventricle (LV) has an incremental value over conventional parameters like ejection fraction for risk stratification in patients referred for cardiac surgery [1]. Mitral annular plane systolic excursion is a simple parameter obtained by M mode, is also an sensitive marker of LV function in various clinical settings [2]. It has been demonstrated that, MAPSE and GLS has similar biological variability in healthy population[3]. The aim of this study was to assess correlation of MAPSE and GLS in patients with ischemic heart disease undergoing coronary artery bypass surgery (CABG).

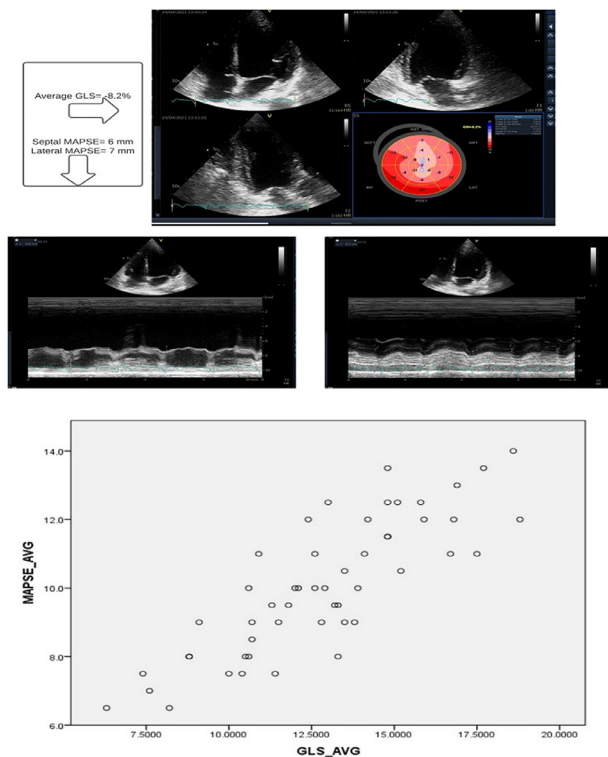
**Methods:** This was a retrospective study of 51 patients undergoing CABG. A cardiac anesthetist performed transthoracic echocardiography exam within 24 hours of surgery. GLS was measured by three apical views: 4-chamber, 2-chamber and long axis view and average value measured. Average MAPSE was obtained in apical 4-chamber view by aligning M mode cursor at lateral and septal mitral annulus and averaging the two values. Measurements of GLS and MAPSE in a sample patient are shown in figure 1. A Pearson’s product-moment correlation was run to assess the relationship between MAPSE and GLS.

**Results:** The average age of patients was 60 years with 26% females. The average mean GLS was -12.8 -2.9% and average

MAPSE was 10.19 mm. Figure 2 shows Pearson's product-moment correlation between two parameters, demonstrating a strong positive correlation with correlation coefficient,  $r = 0.83$  ( $p < .0005$ ).

**Conclusion:** MPASE and GLS are significantly correlated in patients undergoing CABG and MAPSE being simple parameter can be used as surrogate marker for GLS.

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## Thoracic Panel Session – October 27, 2021 CO:09

### A COMPARISON OF ISOLATION AND SPONTANEOUS VENTILATION FOR LUNG MANAGEMENT DURING THORACIC SURGERY: A SYSTEMATIC REVIEW AND META-ANALYSIS

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**Introduction:** General anaesthesia, mechanical ventilation with lung isolation using a double-lumen endobronchial tube or bronchial blocker, has been the standard for lung management during thoracic surgery for over 80 years. However, there has been increasing popularity for avoiding lung isolation and maintaining spontaneous ventilation for video assisted thoracoscopic surgery (VATS) both with patients conscious using regional anaesthesia and unconscious using general anaesthesia. Many benefits of spontaneous ventilation over the traditional approach have been proposed. We hypothesised that spontaneous ventilation would be significantly more efficient than lung isolation for thoracic surgery. The primary aim of this study was to compare the duration of hospital stay in patients undergoing thoracic surgery with lung isolation or spontaneous ventilation for lung management. Secondary aims were the durations of anaesthesia, global in-operating room duration and overall hospital cost.

**Methods:** Systematic search of PubMed, OVID/Embase and Google Scholar from January 2000 - October 2020 was conducted using predetermined inclusion criteria. Bias was assessed using the Cochrane screening method. Each lung management technique was segmented into randomised controlled trials (RCTs) and observational studies and analysed both separately and together. Meta-analysis using the Cochrane RevMan5 software was conducted and findings summarised as forest plots. Mean and 95% confidence intervals were compared alongside assessment of probability and heterogeneity.

**Results:** The literature search identified 649 studies, of which only 23 fulfilled the entry criteria, and these included a total of 2,564 patients. The duration of hospital stay was significantly shorter for spontaneous ventilation than lung isolation (mean: -0.78 days; 95% CI 1.17 - 0.38) in all studies and in RCTs (mean: -0.88 days; 95% CI 1.1 - 0.65). The duration of anaesthesia was significantly shorter in spontaneous ventilation for all studies (mean: -10.87 minutes; 95% CI 9.3 - 12.43) and for RCTs (mean: -13.19 minutes; 95% CI 11.18 - 15.2). Similarly,

global in operating room duration was shorter using spontaneous ventilation for all studies (mean: -33.31 minutes; 95% CI 23.57 - 43.04) and for RCTs (mean: -31.77 minutes; 95% CI 28.49 - 35.05). No statistically significant difference was found between hospital cost for the two techniques but when only RCTs were analysed, spontaneous ventilation was associated with a lower cost (mean: €990; 95% CI €760-1220).

**Discussion:** When compared to the traditional technique of lung isolation under general anaesthesia for thoracic surgery, techniques using spontaneous ventilation either under regional or general anaesthesia, were associated with shorter durations of hospital stay and anaesthesia as well as time spent in the operating room. In addition, hospital costs may also be less expensive using spontaneous ventilation.

## Vascular Panel Session – October 27, 2021 CO:10

### BLOOD AND COAGULATION PRODUCT DISPOSAL IN THE MODERN ERA - A SURVEY AND REVIEW OF CURRENT PRACTICE

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**Introduction:** Perioperative transfusion is associated with reduced survival and increased morbidity and mortality. Several studies report poor adoption of guidelines and wide variation in clinical practice.

However, the influence of simple practical factors is disregarded, as for instance which blood products are available in which time for the transfusing physician? We hypothesize that local practical issues are a relevant cofounder of transfusion decisions.

**Methods:** With kind endorsement of EACTAIC, the link to a web-based survey was sent via newsletter to all EACTAIC-Members via the monthly newsletter in November 2020.

**Results:** The Newsletter was opened by 429 active members. We collected 66 survey responses, with 51 complete surveys, resulting in a response rate of 11.9%

72% of participants report having a local algorithm for the use of blood products and coagulation factors. Several factors were reported as having an influence on the local transfusion algorithm (Figure 1) and on transfusion practice (Figure 2).

Figure 1

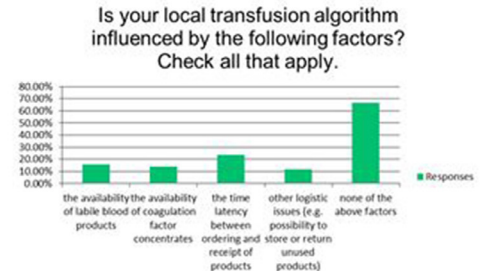


Figure 2

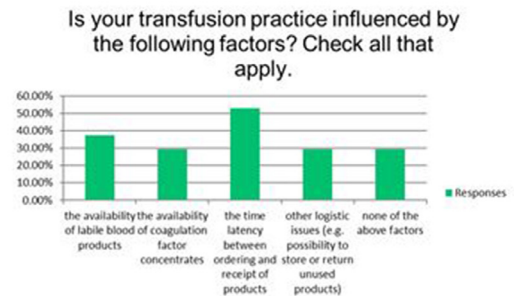
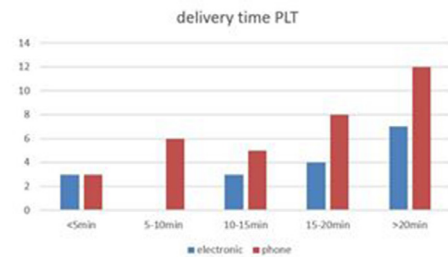


Figure 3



Figure 4



86% of respondents report ROTEM®/TEG® available, 76% haemoglobin tests, 24% quick measurements and 22% Thrombocyte function tests. 6% of the respondents have no point of care test available.



A majority of respondents report the possibility to receive more than 10 labile blood products delivered at once (64%). Packed red blood cells are available with a median time delay of 10-15 minutes (Figure 3). For platelets, a median time between ordering and delivery of 15-20 minutes was reported (Figure 4).

**Discussion:** The data of our survey reveals wide variability in the logistics of perioperative transfusion and significant subjective influence of these logistic factors. The time to delivery of labile blood products was the most mentioned factor. To our knowledge, this is the first study to evaluate logistic factors with influence on transfusion practice. The principal limitation of our survey is the low response rate. In many situations, the transfusing physician has the consequences of a delayed or omitted transfusion directly in sight, while the consequences of unnecessary transfusions remain diffuse. Those subjective benefits of transfusion might lead to a risk-averse behavior, as is known from economy and sociology 4. In combination with (perceived) long delivery times, this might be a contributing factor for transfusion incidence. The adaptation of institutional processes therefore bear potential benefits for better adherence to transfusion guidelines.

In conclusion, transfusion logistics show wide variation across different institutions and are a significant subjective contributor to the individual transfusion behaviour.

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**CPB Symposium: Difficult weaning from cardiopulmonary bypass – October 27, 2021**  
**CO:11**

**PRESERVATION OF RENAL ENDOTHELIAL INTEGRITY AND REDUCITION OF RENAL EDEMA BY APROTININ DOES NOT PRESERVE RENAL PERFUSION AND FUNCTION FOLLOWING EXPERIMENTAL CARDIOPULMONARY BYPASS**

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**Introduction:** Acute kidney injury is a severe complication following cardiopulmonary bypass (CPB) and is associated with capillary leakage and microcirculatory perfusion disturbances. CPB-induced thrombin release results in capillary hyperpermeability via activation of protease-activated receptor 1 (PAR1). Aprotinin (Trasylol), an anti-fibrinolytic, is also suggested to inhibit thrombin-PAR1-induced endothelial hyperpermeability. We investigated whether aprotinin, which is thought to prevent thrombin from activating PAR1, preserves renal endothelial structure, reduces renal edema and preserves renal perfusion and reduces renal injury following CPB.

**Methods:** Rats were subjected to CPB after treatment with 33.000 KIU/kg aprotinin (n=15) or PBS (n=15) as control. The jugular vein and femoral artery were cannulated and connected to the CPB circuit, consisting of a roller pump and membrane oxygenator. A secondary dose of 33.000 KIU/kg aprotinin was given 60 minutes after initiation of CPB. Cremaster and renal microcirculatory perfusion were assessed using intravital microscopy and contrast echography before CPB and 10 and 60 minutes after weaning from CPB. Renal edema was determined by wet/dry weight ratio and renal endothelial structure by electron microscopy. Renal PAR1 gene and protein expression and markers of renal injury were determined.

**Results:** CPB reduced cremaster microcirculatory perfusion by 2.5-fold (15 (10 – 16) to 6 (2 – 10) perfused microvessels, p<0.0001) and renal perfusion by 1.6-fold (202 (67 – 599) to 129 (31 – 292) au/sec, p=0.03) in control animals. Both did not restore 60 minutes post-CPB. This was paralleled by increased plasma creatinine (p<0.01), neutrophil gelatinase-associated lipocalin (NGAL; p=0.003) and kidney injury molecule-1 (KIM-1; p<0.01).

Aprotinin treatment preserved cremaster microcirculatory perfusion following CPB (12 (7–15) vs. 6 (2–10) perfused microvessels, p=0.002), but not renal perfusion (96 (35–313) vs. 129 (31–292) au/sec, p>0.9) compared to untreated rats. Aprotinin treatment reduced endothelial gap formation (0.5±0.5 vs. 3.1±1.4 gaps, p<0.0001), kidney wet/dry weight ratio

( $4.6 \pm 0.2$  vs.  $4.4 \pm 0.2$ ,  $p=0.046$ ), and fluid requirements ( $3.9 \pm 3.3$  vs.  $7.5 \pm 3.0$  ml,  $p=0.006$ ) compared to untreated rats. In addition, aprotinin treatment reduced tubulointerstitial neutrophil influx by 1.7-fold compared to untreated rats ( $30.7 \pm 22.1$  vs.  $53.2 \pm 17.2$  neutrophil influx/section,  $p=0.009$ ). No differences were observed in renal PAR1 expression and plasma creatinine, NGAL or KIM-1 between groups.

**Discussion:** Treatment with aprotinin preserved cremaster microcirculatory perfusion following CPB, but did not prevent renal perfusion disturbances nor renal injury following CPB despite preservation of renal endothelial integrity and reduction of renal edema formation. Future studies should focus on identifying therapeutic strategies to improve renal perfusion and function following CPB.

## ICU Panel Session 1 – October 28, 2021

CO:12

### THE EFFECT OF GOAL-DIRECTED FLUID THERAPY ON THE OCCUR OF ACUTE KIDNEY INJURY IN PATIENTS UNDERGONE CARDIAC SURGERY

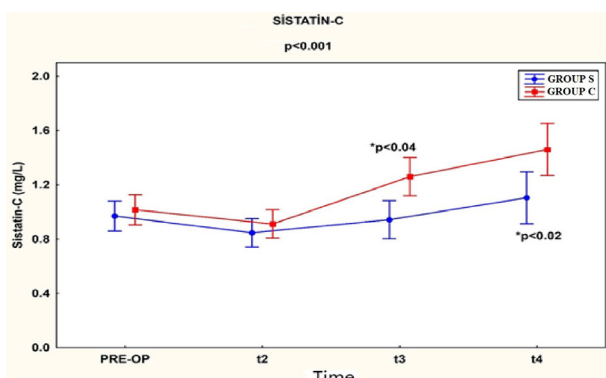
Imge Ozdemir<sup>1\*</sup>, Tulun Ozturk<sup>1</sup>, Dilsad Amanvermez Senarslan<sup>2</sup>, Funda Nizamoglu Yildirim<sup>2</sup>

<sup>1</sup>Celal Bayar University Medicine Faculty, Department of Anesthesiology and Reanimation, Manisa, TURKEY

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**Introduction:** The rate of acute kidney injury (AKI) after open heart surgery is between 3.1% and 42%. Nephrotoxins, ischemia and reperfusion, venous congestion, inflammation, oxidative stress and genetics have been implicated in the development of AKI.<sup>1</sup>

The primary aim of this study was to investigate the effect of goal-directed fluid therapy in the perioperative period on the development of AKI in the early period in patients undergoing cardiac surgery. The secondary aim was to determine the independent risk factors for the development of AKI.



**Methods:** Coronary artery by-pass graft (CABG) and valvular heart disease patients undergoing open heart surgery were randomly divided into two groups according to their perioperative fluid management: Group Control (Group C, n=30): Fluid management was performed with the traditional monitoring method. Group Study (Group S, n=30): Applied with transesophageal doppler and transthoracic doppler fluid management. It was aimed to keep the hemodynamics of the patients at normal values.<sup>2</sup>

Clinical and haemodynamic data were recorded at preoperative baseline (t1), postoperative 4th hour (t2), 24th hour (t3) and 48th hour (t4). Serum creatinine, GFR, Cystatin-C and KIM-1 values obtained at the same time intervals as indicators of AKI. Acute kidney injury was defined by KDIGO classifications.

Two independent groups were compared statistically with appropriate parametric and non-parametric tests. The development of postoperative AKI was investigated by “Forward Stepwise Binary Logistic Regression” analysis.

**Results:** Postoperative fluid requirement was significantly lower in the study group ( $p=0.002$ ). Postoperative total balance was significantly more negative in the study group than in the control group ( $p<0.0001$ ). ERT requirement was significantly lower in the study group compared to the control group (intraoperative,  $p=0.02$ ; postoperative,  $p=0.002$ ). Cystatin-C was significantly lower in the study group at the postoperative 24th and 48th hours. (respectively,  $p<0.04$ ,  $p<0.02$ ) (Fig.1). AKI development rates were similar between the groups ( $p>0.05$ ). In the study group, only age ( $r=0.60$ ,  $p=0.02$ ) and only intraoperative urine output in the control group ( $r=1.1$ ;  $p=0.02$ ) were determined as independent risk factors for the development of AKI. When all cases were evaluated, the Cystatin-C level at the postoperative 4th hour ( $r=0.03$ ;  $p=0.02$ ), intraoperative noradrenalin requirement ( $r=0.74$ ;  $p=0.04$ ) and Euroscore ( $r=0.61$ ,  $p=0.04$ ) parameters were independent risk factors.

**Discussion:** The incidence of AKI development after cardiac surgery was not different between groups. Cystatin-C in Group S patients were significantly lower at the postoperative 24th and 48th hours. Cystatin-C clearance was affected more earlier than creatinine clearance in patients with AKI. Fluid and ERT requirements were less in Group S than Group C and the hospital stay was significantly shorter than the control group.

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**Haemostasis Panel Session: Clotting blood –  
October 28, 2021  
CO:13**

**INTRAOPERATIVE VALIDITY OF POINT OF CARE  
DURING PARTIAL HEPARIN NEUTRALIZATION**

B er enice Tiquet\*, Franck Pihan, Marius Tifrea, Andreea Tifrea, Michel Denizou, Philippe Thomasset, Isabelle Orsel, Jean Philippe Marsaud, J erome Jouan, David Vandroux

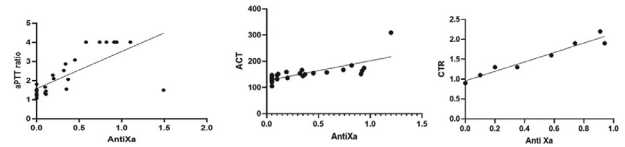
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**Introduction:** Since 2019, at our University Hospital, an unusual rate of patients had hemostasis abnormalities in immediate postoperative period of cardiac surgery. There was no change in practices explaining these anomalies. In order to assess our professional practices, we conducted a prospective study during one month with complete careful hemostasis monitoring: aPTT, AntiXa activity, Activated Clotting Time (ACT) by Hemostasis Management System (HMS) Plus and Quantra if relevant in the operating room after heparin neutralization. Our analyses frequently showed a defect of heparin antagonization. Indeed, several weeks later, a pharmacovigilance alert indicated a 30% under-dosage of the protamine batches. Therefore, we could evaluate the validity of these monitoring devices with incomplete heparin neutralization.

**Methods:** The analysis of coagulation in the operating room was recorded on a collection form. Heparin-induced anticoagulation level and calculation for dose of protamine was tested by the HMS Plus (Medtronic, Minneapolis, MN, USA) device, for all consecutive patients undergoing cardiac surgery. From the same blood sample 15 minutes after the end of protamine infusion, an assay of ACT, aPPT and anti Xa was performed. In case of unusual clinical bleeding, an additional analysis by Quantra was performed. The study protocol has been submitted and approved by the Ethics Committee of the French Society of Anesthesia and intensive care.

**Results:** During the study period, 33 procedures were included, consisting in 26 surgeries with cardiopulmonary bypass and 7 Off-pump coronary artery bypass grafting. Considering a 30% under-dosing for protamine, the initial protamine / initial heparin ratio was 0.56 [0.48-0.64]. ACT, APPT and CTR (Quantra) correlated all well with AntiXa activity (Fig). Spearman coefficients were 0.85 [CI: 0.69-0.93] ( $p < 0.0001$ ), 0.80 [CI: 0.6-0.9] ( $p < 0.0001$ ) and 0.95 ( $p = 0.0012$ ) respectively. However, aPTT was not relevant for AntiXa activity  $> 0.5$  UI. To detect anti-Xa activity  $> 0.2$ , HMS detected residual heparinemia with a sensitivity of 62% [45-78%], a specificity of 94% [50-100%], a positive predictive value of 88% and a negative predictive value of 75%. For ACT, a threshold of 150 sec had a sensitivity of 85% [58-97] and a specificity of 85% [58-97%] for the detection of an antiXa  $> 0.2$  UI and a sensitivity of 100% [72-100] and a specificity of 81% [61-93] for the

detection of aPTT  $> 100$ . A threshold of 1.4 CTR had a sensitivity of 67% [30-94] and a specificity of 100% [18-100] for the detection of antiXa activity  $> 0.2$  and a sensitivity of 100% [56-100] and a specificity of 100% [61-100] for the detection of aPTT  $> 100$ .



**Discussion:** Despite a limited number of assays, we found that both Quantra and HMS were efficient to detect residual heparinemia in the operating room.

**TRANSPLANT&VAD Panel Session 2: Lung Transplantation –  
October 28, 2021  
CO:14**

**PREDICTION OF DYSPNOEA FOLLOWING LUNG  
RESECTION SURGERY: POST-HOC ANALYSIS OF  
'PROFILES' STUDY**

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**Introduction:** Lung cancer is the leading cause of cancer death in Europe. Surgical resection is often the preferred treatment but is associated with morbidity and mortality. Survival with a meaningful quality of life is important; however, the prediction of post-operative dyspnoea (POD) is often difficult and inaccurate. The European Society of Thoracic Surgeons (ESTS) and the (UK) National Institute of Clinical Excellence (NICE) advocate studies concerning operative risk for surgical resection. Conventional prediction uses pulmonary function; predicted post-operative FEV1% (ppoFEV1%) and predicted post-operative DLCO% (ppoDLCO%) with  $< 40\%$  in either domain being 'high risk'. The aim is to improve conventional prediction of the risk of POD and identify a sub-population for targeted recruitment (prognostic enrichment) to interventional studies seeking to mitigate the risk of breathlessness

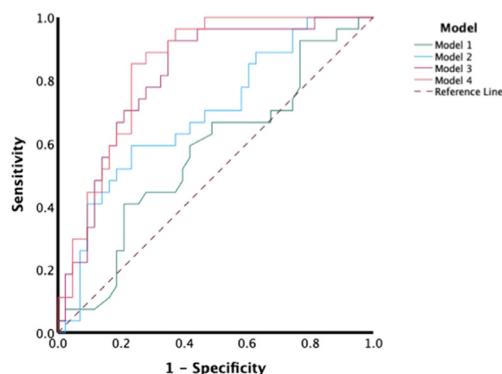


Fig.1 - Model 1- 4: Area Under Receiver Operator Curves values (95%CI) for prediction of MRC >2 in the derivation dataset. Model 1 0.55(0.41 - 0.69), Model 2 0.68(0.56 - 0.81), Model 3 0.81(0.71-0.91), Model 4 0.83(0.74-0.92). (n=93)

**Methods:** With informed consent and ethics approval, we prospectively recruited 250 patients undergoing lung resection in four UK centres. Dyspnoea was measured pre-operatively and 3 months post-operatively using the Medical Research Council (MRC) score. The primary outcome was patients with a post-operative MRC >2, excluding those with an MRC >2 pre-operatively. Two conventional models were derived (n=93, 1 site), before external validation (n=85, 3 sites) using the variables age, gender and ppoFEV1%/ppoDLCO%. Model 1(M1) incorporates ppoFEV1%/ppoDLCO% with conventional cut offs and Model 2(M2) treats them continuously. Using similar internal derivation and external validation, two new models were explored. Univariate analysis identified risk predictors ( $p < 0.1$ ) for candidates with and without the primary outcome. Variables with significance were then used in logistic regression to create Model 3(M3) (M2 with the next-best additional variable- pre-operative EQ-5DL index score) & Model 4(M4) (not pre-defined and selected from all significant variables- ppoFEV1%, BMI, Diabetes status and pre-operative brief pain inventory score). Models were compared using sensitivity, specificity, positive predicted value (PPV), negative predictive value (NPV) and Net Reclassification Indexing (NRI)

**Results:** New models improved prediction within the internal dataset: M2 Vs M4 (AUROC comparison,  $p=0.03$ , NRI 0.26). (Fig.1) The best conventional and new models (M2 & M4) performed similarly within the external population: Sensitivity (55% vs 50%), Specificity (68% Vs 73%), PPV (38% Vs 39%), NPV (81% Vs 81%), respectively.

**Discussion:** This study demonstrates conventional risk prediction for POD using pulmonary function is poor. It also

highlights challenges in creating new scoring tools: at external validation conventional models performed equally to new models with similar sensitivity/specificity/NPV and PPV. Using ppoFEV1%/ppoDLCO% as continuous variables rather than dichotomised at 40%, may increase predictive strength. Future work should explore new variables to predict POD, such as pre-operative quality of life and biomarkers. For prognostic enrichment, models should have high sensitivity & high NPV, targeting those who would benefit most from low-risk interventions

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**Thoracic Panel Session : New Challenges For 2021 – October 28, 2021**  
CO:15

**ENDOBROCHIAL INTUBATION WITH THE KING VISION® AND MCGRATH® LARYNGOSCOPES IN SIMULATED EASY AND DIFFICULT AIRWAYS BY NOVICES (EKINGMATH)**

Alaa Khidr<sup>1</sup>, Jumana Masoudi<sup>2\*</sup>, Sarah Alaboud<sup>2</sup>, Mashael Alshahrani<sup>2</sup>, Aziza Bokhari<sup>2</sup>, Massimiliano Sorbello<sup>3</sup>, Mohamed Khalil<sup>1</sup>, Saeed Al Shadawy<sup>1</sup>, Talal Al Ghamdi<sup>1</sup>, Summayah Fallatah<sup>1</sup>, Mohamed El Tahan<sup>1</sup>

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**Introduction:** The competency of using video laryngoscopes (VL) for double-lumen tube (DLT) endobronchial intubations can be improved with constant training as assessed by measuring the learning curves. We hypothesized that the time to DLT intubation would be reduced over the intubation attempts.

**Methods:** Forty-two novice medical students unfamiliar with DLT intubation were randomly allocated to two sequences, including DLT intubation using King Vision and McGrath VLS, in a



randomized crossover manikin study. Each participant completed 100 DLT intubation attempts on both simulated airways using the study devices (25 attempts for each). The primary outcome was the time to DLT intubation. The secondary outcomes included the best glottic view, optimizing maneuvers, and intubation first-pass success. The learning curve for each participant was measured using the Cumulative Sum (CUSUM) analysis. [1,2]

**Results:** The use of King Vision VL was associated with significantly shorter time to DLT intubation ( $p < 0.044$  and  $p < 0.05$ , respectively) and a higher percentage of glottic opening (POGO) compared to the McGrath VL ( $p < 0.011$  and  $p < 0.002$ , respectively) in the simulated ‘easy’ and ‘difficult’ airway over most of the intubation attempts. In the simulated ‘easy’ airway, the first-pass success ratio was higher when using the King Vision® VL (median [Minimum-Maximum] 100% [100% - 100%] and 100% [88% - 100%],  $p = 0.012$ ). The results of the CUSUM analysis are shown in Figure 1.

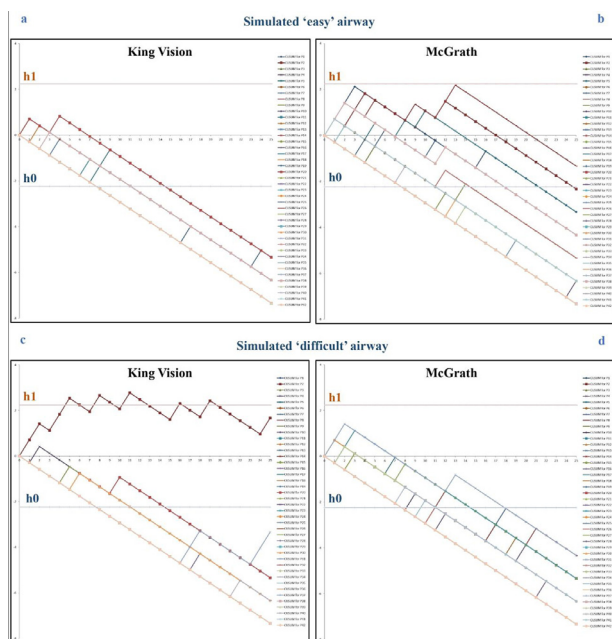


Figure 1. The CUSUM analysis charts for the 25 intubation attempts using the King Vision® and McGrath® in the simulated ‘easy’ and ‘difficult’ airway models. Lines CUSUM for P1 to CUSUM for P42 represent the learning curves of individual students. Orange and blue Lines h1 and h0 represent upper and lower control limits of 2.24 and -2.24, respectively. Y-axis values represent multiples of h1 and h0. P1...P42: Participant 1...Participant 42. If the learning curve crosses H0 from above, it means that the measured percentage failure does not

differ from the acceptable failure rate with a type 1 error equal to  $\alpha$  and a type 2 error equal to  $\beta$ . When the student crosses the H0 boundary, it is considered that the proficiency level has been achieved for the procedure assessed. [1,2]

**Discussion:** Novice medical students developing skills over intubation attempts translated into faster DLT intubation and higher success rate on simulated ‘easy’ and ‘difficult’ airways. A median of 9 DLT intubations is required to achieve a 92.2% or greater DLT intubation success degree.

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**Plenary Joint Session ERACS: Optimizing care in cardiac surgery – October 28, 2021**  
**CO:16**

#### THE IMPORTANCE OF THYROID HORMONE LEVELS AFTER HEART SURGERY – PRELIMINARY STUDY

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**Introduction:** Thyroid hormone level suppression after serious operations as coronary artery bypass graft (CABG) surgery, and aortic valve replacement (AVR) is a quite common phenomenon. It is called the nonthyroidal illness syndrome.

This appears with a decrease in triiodothyronine (T3) and tetraiodothyronine (T4) serum levels with no thyroid disorders in the medical history. Our aim was to investigate the relationship among thyroid hormone levels and postoperative complications after CABG and AVR.

**Methods:** This single center retrospective, observational study approved by the IRB (65/2017). 49 patients, who underwent CABG or AVR, were enrolled in our study between the 1st of January 2019 and the 16th of February 2021. Demographic parameters, Euroscore, thyroid disorders, T3, T4 levels in the first postoperative week, perioperative thyroxine supplementation and the vasopressor- inotropic needs were summarized in our database. Our primary outcome was 1-year mortality, secondary outcome was the length of stay in the intensive care unit (ICU). Spearman's correlation and Cox-regression analysis were used for the statistical analysis.

**Results:** Final analysis included 49 patients, 9 (18.4%) were female. The median survival time was 584 days (IQR25-75: 571-614). Five of the 49 patients (10.2%) died until the 16th of February 2021. Seven patients (14.3%) stayed in ICU for more than 72 hours. Four patients (8.2%) were treated with thyroxine in the postoperative period whom did not have preoperative thyroid dysfunction. None of the patients had hypothyroidism nor hyperthyroidism in their medical history. 17 patients (34.7%) had low T3 levels while, none of the patients had low T4 levels on the 1st or 2nd postoperative day. Association was found between the lengths of stay in the ICU and low T4 levels ( $p=0.048$ ) using nonparametric test. The actual change in T4 levels between the first and the second sample during first postoperative week showed a significant association with 1-year mortality (OR: 1.17; 95%CI: 1.04-1.31;  $p=0.007$ ).

**Discussion:** Our results highlight the role of thyroid function in the postoperative period. The decrease of T4 levels have independent relationship with adverse outcomes as 1-year mortality and the lengths of ICU stay. Thyroid function monitoring could be a beneficial after CABG and AVR operations.

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**ECHO Panel session: 3D\* ECHO PANEL –  
October 28, 2021  
CO:17**

### AN UNEXPECTED INTRAOPERATIVE UNUSUAL CASE OF AORTIC STENOSIS

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**Introduction:** Aortic stenosis is the most frequent valvular pathology in the developed countries (1). It is most often due to the calcified or degenerated aortic valve as a manifestation of ageing.

Sub-valvular aortic stenosis is rare in the adult population being more common in children accounting for 8-20% of left ventricular outflow tract (LVOT) obstructions (2). Stenosis degree may change depending on the malformation varying from a minor ridge to a complete fibrous ring or tunnel.

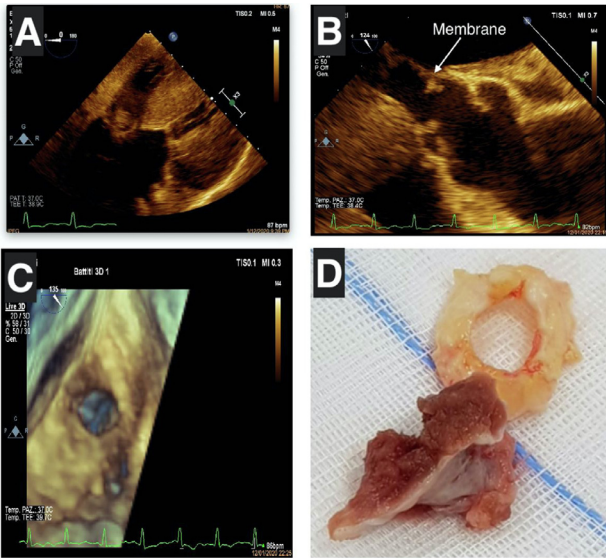
Although proper timing for surgery is unclear, diagnosis might be more difficult in the adult patient with transthoracic echocardiography as subvalvular portions of the LVOT might be shaded by calcium and difficult to visualize. We report a case of a 65 years old lady diagnosed with severe aortic stenosis and scheduled for aortic valve surgery.

**Methods:** The patient presented to our department with recent history of shortness of breath and clinical and transthoracic echocardiographic diagnosis of severe aortic stenosis. The maximum blood velocity across the aortic valve was 4.8 m sec<sup>-1</sup> at continuous Doppler sampling. She was scheduled for aortic valve replacement. After establishing hemodynamic monitoring, general anaesthesia induction was performed with remifentanyl, propofol and cisatracurium and maintained as TIVA. According to our protocol, a transesophageal echocardiography (TEE) was positioned and a baseline TEE was performed.

**Results:** TEE demonstrated a massive concentric hypertrophy of the left ventricle, a membranous subaortic stenosis and a normal aortic valve (fig. 1A,1B,1C). Surgery was then halted as the patient's written consent had been obtained for a valve replacement. Then the patient was further investigated by ECG gated cardiac CT scan, which confirmed the subvalvular membrane.

The patient was then operated to remove the subvalvular membrane and a partial septal myectomy was also executed

(fig 1D). She completely recovered and was discharged home on p.o. day 5.



**Discussion:** Differential diagnosis between aortic valvular stenosis or stenosis due to a subvalvular obstruction might be tricky, but is crucial for the operation result. TEE 2D and 3D imaging recognised the anomaly prior to surgery and so allowed to properly address the cardiac disease leading to post-operative success.

Perioperative TEE should be performed in a systematic manner according to the current guidelines (3), but beyond the level of re-confirming the expected findings prior to surgery. TEE allowed for rapid and thorough recognition of previously undiscovered pathology leading to proper patient's management and case resolution, so confirming the importance of perioperative TEE in the setting of surgical treatment of heart valve diseases.

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## Congenital Panel Session: VAD & Extracorporeal life support – October 28, 2021 CO:18

### NEAR-INFRARED SPECTROSCOPY FOR MONITORING DISTAL LIMB PERFUSION DURING PEDIATRIC MINIMAL INVASIVE CARDIAC SURGERY FOR CONGENITAL HEART DEFECTS

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**Introduction:** Acute femoral artery occlusion due to remote access bypass (femoral arterial cannulation), is a routine for pediatric minimal invasive cardiac surgery and prevention of leg ischemia is necessary. This technique requires peripheral vessel cross clamping, which may lead to transient perfusion deficit of the lower extremities. Strategies to prevent muscle necrosis or development of compartment syndrome include invasive or non-invasive monitoring of tissue oxygen saturation of involved extremity. A variety of means are utilized, to assess lower extremity (LE) perfusion – including pulse palpation, pulse oximetry, subjective assessment of LE by colour, temperature etc. Regional oxygen saturation measured by near-infrared spectroscopy (NIRS), used as a potential surrogate of cerebral and somatic mixed venous oxygen saturation is a noninvasive tool to continuously monitor LE perfusion. We sought to evaluate the safety of peripheral arterial cannulation by using NIRS in such subset of patients.

**Methods:** We evaluated 50 pediatric patients, weight 10-30kg, age 3-12years, divided in: Group A (N=25), - underwent peripheral femoral artery cannulation for remote access perfusion for MICS, group B (N=25), receive conventional sternotomy incision. All patients were monitored by transcutaneous NIRS (placed on calves of both legs) for quality control of distal leg perfusion during cardiopulmonary bypass. Baseline NIRS value, followed by continuous NIRS values were recorded. Total creatinine kinase (CK) and serum myoglobin levels, mid-thigh and mid -calf circumference (to rule out compartment syndrome), were measured at preoperatively, 6hour and 24hour after surgery. Intra-operatively, all hemodynamic parameters along with blood gas parameters like PH, PO<sub>2</sub>, PCO<sub>2</sub>, SCVO<sub>2</sub>, lactate etc. were recorded at baseline, on bypass, clamp on, clamp off and off bypass period. Total CPB time, ventilation duration, hospital and ICU stay were also recorded.

**Results:** The baseline NIRS comparable in group A ( $72.6 \pm 6.86$ ) over cannulated versus ( $71.76 \pm 4.05$ ), contralateral leg, while, in group B, it was ( $69.96 \pm 5.75$  vs.  $69.84 \pm 5.50$ ). During clamping of femoral artery in Group A, NIRS dropped to



39.12±5.60 (vs. baseline), while it remained stable in the contralateral leg and group B patients. After successful implantation of the distal leg perfusion, the NIRS normalized to baseline within 5 to 7 minutes. Myoglobin and CK levels increased in both the groups, more so in Group A. There were no clinical side effects from increased CK or myoglobin. None of our patients had residual vascular complications. ±±±±

**Discussion:** We speculate that remote CPB with direct femoral artery cannulation can be safely used in pediatric patients with a body weight 10-30 kg and CPB time less than 60 minutes- without increasing operative morbidity and complications. When prolonged CPB time is expected probably one should change the MICS policy by adding selective distal leg perfusion to minimize the complications

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**ECHO Panel Session: To Be Or Not To Be: decision making in perioperative echocardiography – October 29, 2021**  
CO:19

#### INTRAOPERATIVE DIAGNOSIS WITH TRANSESOPHAGEAL ECHOCARDIOGRAPHY OF LARGE THROMBUS IN THE VEIN CAVA INFERIOR DURING REMOVAL OF VENO-ARTERIAL EXTRACORPOREAL MEMBRANE OXYGENATION DURING POSTOPERATIVE CARE OF CARDIAC TRANSPLANTATION

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**Introduction:** Complications during extracorporeal membrane oxygenation (ECMO) therapy are frequent and are associated with a significant increase in morbidity and mortality, so early recognition and treatment is essential. The difficult balance between the need for anticoagulation and the management of bleeding events is one of the main challenges in the care of patients treated with this therapy. Transesophageal echocardiography (TEE) has become a fundamental tool in the field of anesthesia during cardiovascular surgery (CCV), both for hemodynamic monitoring and diagnosis of possible complications during the perioperative period.



**Methods:** A 33-year-old woman underwent heart transplantation for end-stage heart failure secondary to cyanotic congenital heart disease, with 3 previous corrective surgeries. In the first postoperative hours, she developed severe right ventricular systolic dysfunction requiring placement of ECMO V-A, with 21 French venous cannula and 18 French arterial cannula. During the first few days, she required reoperation on two occasions due to cardiac tamponade, forcing the temporary suspension of anticoagulation. After 10 days of ECMO and due to improvement of right ventricular function, she was transferred to the operating room for removal of the cannulae. During anesthetic monitoring by TEE, and once the venous cannula had been removed, a large thrombus was observed extending from the right atrium to the suprahepatic veins (Figure 1). After evaluating different therapeutic options, medical treatment with systemic heparinization with unfractionated heparin (UFH) was decided. Subsequent ultrasound controls showed the disappearance of the thrombus. After 30 days the patient was discharged from the ICU.

**Results:** Hemostatic complications, both thrombotic and hemorrhagic, are one of the main complications of ECMO. Sometimes both complications can occur in the same patient, as occurred in the patient presented in this case report. Due to the numerous hemorrhagic complications, during ECMO therapy, it was necessary to suspend UFH therapy on numerous occasions with the consequent deficit in anticoagulation levels, which favored the formation of a large thrombus in the inferior vena cava diagnosed during the intraoperative phase of ECMO withdrawal. TEE constitutes a quality standard in cardiovascular surgery. It is a fundamental tool for both monitoring and diagnosis in the perioperative period, allowing correct surgical planning and assessment of the response of the cardiovascular system to surgical and pharmacological interventions. The latest published guidelines establish that intraoperative TEE should be performed in most cardiac surgery procedures, as well as in the implantation and removal of ventricular assistance and extracorporeal membrane oxygenation

**Discussion:** We report a case where the intraoperative use of TEE, during the removal of ECMO cannulae, was essential for the detection and early initiation of treatment of a serious complication, such as extensive thrombosis around the venous cannula.

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### ICU Panel Session 2: Rhythmic problems in cardiothoracic ICU – October 29, 2021 CO:20

#### DEXMEDETOMIDINE IN CARDIAC SURGERY: JUDGE, JURY AND EXECUTIONER A FREQUENCY OF BRADYARRHYTHMIAS AND ATRIOVENTRICULAR BLOCKS IN CARDIAC SURGERY

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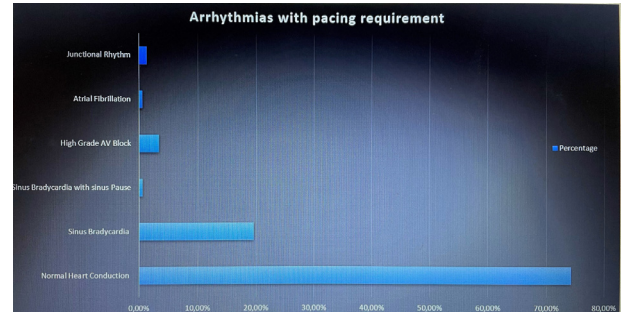
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**Introduction:** Dexmedetomidine is an alpha 2 agonist drug with several theoretical benefits supported in the literature for cardiac surgery including a decrease of mortality (1, 2); however, many anesthesiologists restrict its use due to side effects such as disturbances of the cardiac conduction system. Therefore, it is important to describe the rhythm alterations associated with the use of dexmedetomidine in the postoperative period of cardiac surgery, and its impact in the postoperative course of this patient population. The following study pretends to describe the frequency of appearance of Atrial Ventricular

Blocks related to the intraoperative use of dexmedetomidine in patients undergoing cardiovascular surgery.



**Methods:** After IRB approval of a cross sectional descriptive study. All patients undergoing cardiac surgery under general anesthesia with dexmedetomidine 0.5mcg/kg/h since the beginning of the case between 2015 and 2019 at the center were included. Most data were taken from the anesthesia and intensive care unit medical records. Standard demographic variables were collected, frequency measures were established for relevant events such as bradyarrhythmias, and their frequency was described according to severity and need for intraoperative and postoperative intervention.

**Results:** 148 patients who underwent simple or combined surgical procedures were included in the study; the prevalence of atrioventricular blocks was 6%, according to its severity, first degree blocks were reported in 2.7%, second degree blocks were reported in 0.6% and complete blocks were reported in 2.7%. Bradyarrhythmias associated with the use of dexmedetomidine varies between 24.2% - 28.2% (period) depending on the time of diagnosis. According to its severity, sinus bradycardia varies between 20.1% - 24.32%, and nodal rhythm 0.6% - 1.2%. 25.6% of the patients required transient postoperative pacemakers, 1.2% of the patients required a permanent pacemaker. The most frequent tachyarrhythmia was atrial fibrillation in 14.8%. An overall mortality of 2% was reported.

**Discussion:** The use of dexmedetomidine predisposes to an increase in the presentation of sinus bradycardia in the immediate postoperative period of cardiovascular surgery compared to that reported in the literature, without increasing the prevalence of atrioventricular blocks. There is a greater tendency to use an epicardial pacemaker during the intraoperative period, which for the most part was not necessary in the immediate postoperative period. There is a decreasing trend in the presentation of atrial fibrillation as described in previous studies.

There is no increase in the mortality of these patients compared to local and international reports. Prospective studies are required to verify the exploratory findings of this study and judge its benefits against the development of bradyarrhythmias in this patient population.

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## Haemostasis Panel Session 2: Masterclass workshop Transfusion & Haemostasis – October 29, 2021 CO:21

### COMBINED PLATELET AND ERYTHROCYTE SALVAGE DURING ON-PUMP CARDIAC SURGERY USING SAME™ BY I-SEP AUTOTRANSFUSION DEVICE: INTERIM ANALYSIS OF THE I-TRANSEP STUDY

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**Introduction:** Cell salvage has proven a reduction in the need for perioperative allogeneic blood transfusion in cardiac surgery. However, current centrifugation-based autotransfusion devices can only salvage red blood cells while blood platelets are removed during the process. The same™ by i-SEP device (Smart Autotransfusion for ME, i-SEP, France) is an innovative filtration-based autotransfusion device able to salvage both red blood cells and platelets without significant impact on cell integrity and function<sup>1</sup>. Our objective was to evaluate the safety and performance of the same™ device during on-pump cardiac surgery.

**Methods:** In a prospective, multicenter, single-arm study, we included adult patients undergoing on-pump elective cardiac surgery (isolated coronary artery bypass graft, valve replacement or aortic root surgery) without anemia and thrombocytopenia. Patients receiving uninterrupted P2Y12 inhibitors, vitamin K antagonists or direct oral anticoagulants were excluded. The device was used intraoperatively to treat shed and residual cardiopulmonary bypass blood. Samples from the collection reservoir and the concentrated blood were analyzed for each device treatment cycle. Primary performance endpoints were a red blood cell minimal recovery of 80% and a minimal hematocrit of 40%. Primary safety endpoints were a minimal heparin and free hemoglobin removal ratios of 90% and 75% respectively. Secondary performance and safety endpoints included platelet recovery and function (flow cytometric analysis of platelet glycoproteins), post-operative bleeding, transfusion and adverse events up to 30 days. All safety data were independently reviewed by a Data Safety Monitoring Board.

**Results:** Twenty-six patients were included in this first interim analysis. Mean age was 68.3±8.7 years, 89% were men. Cardiac procedures included isolated coronary artery bypass graft (27%), isolated valve replacement (62%) and aortic root surgery (11%). Mean reinfused blood volume was 577±278 mL, corresponding to 1714±683 mL of salvaged blood. Mean processing time was 6±2 min for each 500mL of salvaged blood. Red blood cell recovery was 85.7±6.8 % with post-treatment hematocrits of 42.4±4.9 %. Removal ratios were 99.9±0.3 % and 94.6±14.4% for heparin and free hemoglobin, respectively. Platelet recovery was 49.4±15.6 % with post-treatment counts of 119±42 G/L. Platelet function, evaluated by flow cytometric analysis, was found unaltered by the device as demonstrated by a limited platelet activation and a strong response to thrombin pathway stimulation. Mean 24-hour chest tube output was 493±228 mL. No plasma or platelet transfusion was reported, while early postoperative (<24h) packed red blood cell transfusion was needed for one patient. No adverse device effect was reported.

**Discussion:** This first interim analysis demonstrated the performance and safety of the same™ by i-SEP device during on-pump cardiac surgery. For the first time, both platelets and red blood cells were salvaged with a fast processing time, without significant impact on platelet function. At the same time, the



washing performance of the device prevented reinfusion of high concentration of heparin.

**References:** 1. Mansour A, Decouture B, Roussel M, Lefevre C, Skreko L, Picard V, Ouattara A, Bachelot-Loza C, Gaussem P, Nessler N, Gouin-Thibault I: Combined Platelet and Erythrocyte Salvage: Evaluation of a New Filtration-based Auto-transfusion Device. *Anesthesiology* 2021 doi:10.1097/aln.0000000000003820

**Plenary Joint Session ERATS: Optimizing care in thoracic surgery – October 29, 2021**  
**CO:22**

**ANATOMICAL INNERVATION AND PHARMACOLOGY OF INTERFASCIAL PLANE REGIONAL ANALGESIA FOR THORACIC SURGERY AND TRAUMA**

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**Introduction:** Opioid analgesia for thoracic surgery and trauma may be associated with adverse effects including respiratory depression, cough suppression and diminished consciousness. These adverse effects can be minimised using interfascial plane regional analgesia such as the erector spinae and serratus anterior plane blocks (ESPB and SAPB) as first described by Forero and colleagues and Blanco and colleagues, respectively.<sup>1,2</sup> This systematic review aims to evaluate the anatomical evidence underlying innervation and dermatomal distribution of these two regional analgesic techniques. Additionally, the pharmacokinetics of ESPB and SAPB were compared.

	ESPB	SAPB
Maximal anatomical spread (cadaveric dissection)	T2-11	T2-12
Maximal dermatomal spread (loss of pinprick and thermal sensation)	T1-11	T2-10
Innervation affected	Dorsal rami of the thoracic and abdominal spinal nerves, with variable spread ventrally.	Lateral cutaneous branches of the intercostal nerves.

**Methods:** Google Scholar, DiscoverEd, and PubMed were searched using key words: ESPB, SAPB, nerve block, local anaesthetic systemic toxicity, dermatomal spread, pharmacokinetics.

**Results:** The search yielded 39 papers investigating anatomical and pharmacokinetic evidence of which 11 were identified as relevant (Table 1). Table 1 found as an attachment

**Pharmacokinetic Results:** The most commonly used local anaesthetic was bupivacaine and the use of adjuvants was infrequent. As proposed by Luftig and colleagues,<sup>3</sup> a larger volume of a weaker concentration appears to reduce the chance of local anaesthetic systemic toxicity. Anatomical spread is dependent upon the dose and site of injection. Techniques can be easily taught and reproduced.

**Discussion:** The anatomical and pharmacokinetic evidence supports use of both techniques for thoracic regional analgesia with ESPB spreading more caudally than SAPB. However, there is anatomical variance between patients in the spread of each block. Pharmacokinetic evidence supports the use of low-concentration, high-volume local anaesthetic for optimal efficacy and limited toxicity.

**References:** 1. Blanco R et al. Serratus plane block: a novel ultrasound-guided thoracic wall nerve block. *Anaesthesia*. 2013; 68(11):1107-1113.  
 2. Forero M, Adhikary SD, Lopez H et al. The erector spinae plane block: a novel analgesic technique in thoracic neuropathic pain. *Regional Anaesthesia and Pain Medicine*. 2016; 41:621-627.  
 3. Luftig J et al. The authors reply to the optimal dose and volume of local anaesthetic for erector spinae plane blockade for posterior rib fractures. *American Journal of Emergency Medicine*. 2018; 36(6):1103-1104.

**Closing Ceremony Session- October 29, 2021**  
**CO:23**

**MITOCHONDRIAL OXYGENATION DURING CARDIO-PULMONARY BYPASS: A PILOT STUDY**

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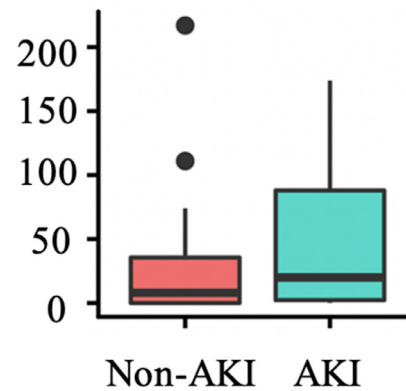
**Introduction:** Cardiopulmonary bypass (CPB) is used during cardiac-surgery and provides oxygenated blood to the tissues. Ensuring adequate oxygenation is essential for the preservation of organ function during CPB. Both hypoxia and hyperoxia result in undesired outcomes and a narrow window for optimal oxygenation exists. Current perioperative monitoring techniques are not always sufficient to monitor adequate oxygenation, especially in high-risk patients. Near-infrared spectroscopy (NIRS) tissue oxygen measurement (StO<sub>2</sub>) is widely used to monitor tissue oxygenation but responds slowly to change. However, the novel non-invasive COMET-monitor measures the mitochondrial oxygen tension

(mitoPO<sub>2</sub>) in the epidermis using the enhanced mitochondrial Protoporphyrin IX Triplet State Lifetime Technique (PpIX-TSLT). The mitoPO<sub>2</sub> reflects the local balance between oxygen supply and consumption and provides an insight into the microcirculatory system [1]. This pilot study investigates the correlation between mitoPO<sub>2</sub> versus StO<sub>2</sub> and varying hemodynamic conditions during CPB and the development of acute kidney injury (AKI).

**Methods:** This single center observational study examined 41 cardiac-surgery patients requiring CPB. Six-hours pre-operatively, patients received a 5-aminolevulinic acid plaster on the upper arm to facilitate the mitoPO<sub>2</sub> measurements. After induction of anesthesia, both the COMET and INVOS measurements were executed in 5-minute intervals throughout the procedure. To compare mitoPO<sub>2</sub> with StO<sub>2</sub>, NIRS probes were placed near the COMET probe. Post-operatively, both measurements were stopped simultaneously, and the patients were observed until discharge for the development of AKI.

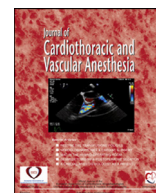
**Results:** NIRS data was available for 31 of the 41 patients. The median mitoPO<sub>2</sub> at the start of surgery was 63.5 [40.0 – 74.8] mmHg and significantly decreased ( $p < 0.01$ ) to 36.4 [18.4 – 56.0] mmHg by the end of the surgery. The average mitoPO<sub>2</sub> was 44.1 [30.6 – 53.3] mmHg. The median StO<sub>2</sub> was 80.5 [76.8 – 84.3] mmHg and did not change significantly. Clamping of the aorta and the switch to non-pulsatile flow resulted in a median mitoPO<sub>2</sub> decrease of 7 mmHg ( $p < 0.01$ ). The cessation of the clamping period and return to pulsatile flow resulted in an increase of 4 mmHg ( $p < 0.01$ ). Lastly, 4 patients developed AKI according to the KDIGO criteria, this group spent 32% of the operation time with a mitoPO<sub>2</sub> value under 20 mmHg as compared to 8% in the non-AKI group.

*Figure 1: Duration in minutes of mitoPO<sub>2</sub> < 20mmHg for AKI-groups*



**Discussion:** In contrast to StO<sub>2</sub>, the mitoPO<sub>2</sub> decreased significantly during CPB time. A hemodilution study in pigs also demonstrated that mitoPO<sub>2</sub> is more likely to change than StO<sub>2</sub>, which reacted slowly to change. The mitoPO<sub>2</sub> also significantly decreased during non-pulsatile flow and increased once pulsatile flow returned, whilst the StO<sub>2</sub> did not. This highlights the sensitivity of mitoPO<sub>2</sub> to detect circulatory and microvascular changes early through the analysis of oxygen delivery on a cellular level. Lastly, the association found between the AKI and the non-AKI group in time spent below a mitoPO<sub>2</sub> of 20 mmHg must be further examined in a well powered study. However, it highlights the potential of this technique to be an early predictor of ischemia.

**References:** [1] Mik EG et al. Mitochondrial PO<sub>2</sub> measured by delayed fluorescence of endogenous protoporphyrin IX. *Nat Methods*. 2006 Nov;3(11):939-45.



## EACTAIC-ICCVA Joint Congress

### POSTERS

PP:01

#### OPIOID-FREE ANESTHESIA IN CORONARY ARTERY BYPASS GRAFTING (CABG) SURGERY, DURING A DRUG SHORTAGES PERIOD IN THE COVID 19 PANDEMIC

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**Introduction:** Describe the effectiveness of opioid-free multimodal anesthetic/analgesic technique for CABG surgery during drug shortages period in COVID 19 pandemic.

VARIABLE	MEAN
Age (years)	62
Height (cms)	1,68
Weight (kg)	77,5
Male %	(2) 50%
Female %	(2) 50%
ASA Classification	III
Euroscore (%)	4,86
Miocardial revascularization	4 (100%)
12 Hours VAS	3
24 Hours VAS	7
48 hours VAS	4

**Methods:** Four patients with moderate and elevated EUROSCORE II, underwent to 2 and 3 vessel myocardial revascularization, three patients were undertaken Off-pump and the last one On-pump, using the same anesthetic/analgesic technique to assess pain control, opioid requirement in 48 hours, hemodynamical stability, time at the intensive care unit, delirium, postoperative nausea and vomiting (PONV).

Standard basic and invasive monitoring was used and a sedline monitor to measure hypnotic depth. In a sitted position a bilateral erector spinae block (ESPB) guided by ultrasound was placed at T6 and T7 level with a 17G Tuohy needle, through which 10 ml of 0.25% bupivacaine + 10 ml of 0.5% lidocaine without epinephrine was administered, with a catheter placement to continue analgesic management in postoperative period.

Anesthetic induction was performed with dexmedetomidine at 0.6 mcg/kg/h during preoxygenation for 5 minutes, lidocaine at 1 mg/kg, Propofol at 1 to 1.5 mg/kg, rocuronium between 0.6 and 1.2 mg/kg, dexamethasone 8 mg and the first paracetamol dose of 15 mg/kg was given. The maintenance was target with sedline monitor using PSI and performed with sevoflurane between 0.7 and 0.8 CAM, dexmedetomidine between 0.4 and 0.6 mcg/kg/h, ketamine 0.2 mg/kg/h and within the skin closure the infusion through erector spinae catheters was started between 5-8 ml/h of bilateral 0.125% bupivacaine, continued with paracetamol 15 mg/kg every 8 hours. The protocol considered using opioids as a rescue therapy with hydromorphone or morphine according to pain, quantifying the requirement in the first 48 hours.

**Results:** Pain assessment through Visual Analogue Scale (VAS) showed peak value at 24 hours (VAS mean value of 7), with lower levels at first 12 and 48 hours (mean values of 3 and 4 respectively). Correspondingly, opioid use was increased in the first 24 hours, a mean of 6,9 mg between morphine equivalent doses, with a posterior drop (a mean value of 1,6 mg) in all patients but one. All patients required vasopressor and inotropic in two cases, however with low doses and adequate progressive withdrawal. No patient presented PONV or delirium in the first 48 hours.

**Discussion:** Opioid-free anesthesia is a feasible strategy in patients undergoing CABG surgery, it gives an adequate depth anesthetic parameters keeping adequate hemodynamic stability, with an optimal control of both endocrine and metabolic changes and having acceptable time of stay in the intensive care unit with no increase in morbidity and mortality outcomes. We believe this experience gives the support to continue affording care of urgency cardiac surgery and could be extrapolated to non-cardiac surgery.

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## PP:02

## EFFECTS OF PERIOPERATIVE GLYCEMIC VARIABILITY ON POSTOPERATIVE ACUTE KIDNEY INJURY AFTER OFF-PUMP CORONARY ARTERY BYPASS GRAFTING: A SINGLE-CENTER RETROSPECTIVE STUDY

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**Introduction:** To investigate the effects of perioperative glyce- mic variability on postoperative acute kidney injury after off-pump coronary artery bypass grafting

**TABLE1.** Clinical characteristics, preoperative data, operative data and outcomes. Continuous variables are presented at median±SD or median [interquartile range] and categorical variables are presented as n (%)

	intraoperative MGD quartile				P value
	First (n=297)	Second (n=301)	Third (n=299)	Fourth (n=205)	
<b>Demographics</b>					
Gender (female)	52(0.18)	64(0.21)	98(0.33)	124(0.41)	<0.001
Age (year)					<0.05
<45	12	8	8	2	
45-60	125	101	91	104	
60-75	184	180	186	181	
>75	6	12	14	18	
BMI (kg m <sup>-2</sup> )	26.9±3.7	25.6±3.3	26.0±3.3	25.0±2.9	<0.001
<b>Clinical history</b>					
NYHA class					0.64
I and II	40(0.13)	42(0.14)	42(0.14)	38(0.12)	
3 and 4	108(0.36)	111(0.37)	126(0.42)	118(0.39)	
KRIP class					0.88
I	2(0.01)	3(0.01)	1(0.00)	4(0.01)	
II	9(0.03)	6(0.02)	5(0.02)	7(0.02)	
III	7(0.02)	6(0.02)	2(0.01)	7(0.02)	
Diabetes mellitus	55(0.19)	79(0.26)	91(0.30)	124(0.41)	<0.05
no drug	0	6(0.02)	3(0.03)	6(0.04)	
Use drug	45(0.82)	55(0.70)	77(0.83)	103(0.77)	
Use insulin	10(0.18)	18(0.23)	11(0.12)	29(0.19)	
Hypertension	174(0.59)	155(0.51)	162(0.54)	172(0.56)	0.32
Hypertension	129(0.43)	112(0.41)	120(0.40)	124(0.40)	0.47
History of myocardial infarction	78(0.26)	65(0.22)	68(0.23)	82(0.27)	0.24
History of cerebrovascular accident	33(0.11)	38(0.13)	39(0.13)	44(0.14)	0.68
COPD	4(0.01)	5(0.02)	7(0.02)	5(0.02)	0.82
<b>Preoperative data</b>					
LVEF(%)	59.3±7.8	59.8±7.1	59.7±7.2	56.8±9.1	<0.05
glycosylated hemoglobin (%)	6.1±1.1	6.4±1.4	6.7±1.6	7.2±1.7	<0.001
glucose (mmol/L)	5.5±1.6	5.8±1.9	6.1±2.6	6.8±2.8	<0.001
creatinine (mmol/L)	68.2±13.7	68.4±13.1	66.9±13.2	67.6±14.8	0.49
<b>Operative data</b>					
Duration of the surgery (min)	225.0±69.0	240.4±66.7	244.6±66.6	351.1±77.2	<0.05
intraoperative crystalloid (ml)	1000[500-1825]	1000[600-1600]	1100[600-1700]	1000[700-1600]	0.14
intraoperative colloid (ml)	1000[600-1000]	1000[500-1000]	1000[500-1000]	1000[575-1000]	0.87
Number of red blood cell transfusion	7(0.02)	8(0.03)	8(0.03)	17(0.06)	0.09
Autologous blood transfusion(ml)	310[209-433]	328[220-462]	340[223-370]	335[221-826]	<0.05
Estimated blood loss(ml)	300[100-500]	400[280-600]	450[300-600]	450[300-600]	<0.001
Urine output (ml)	2200[1500-2800]	2300[1600-3000]	2200[1600-3000]	2200[1500-3000]	0.30
<b>Blood glucose</b>					
Max glucose(mmol/L)	10.2±1.4	12.2±1.2	14.0±1.2	17.6±2.0	<0.001
MG(mmol/L)	8.2±1.1	9.2±1.2	9.9±1.2	10.9±1.6	0.76
<b>Outcomes</b>					
NO AKI	232(0.78)	237(0.79)	212(0.71)	184(0.60)	<0.001
AKI	65(0.22)	65(0.22)	87(0.29)	121(0.40)	<0.05
Stage I	55(0.85)	57(0.87)	78(0.84)	81(0.67)	
Stage II	10(0.15)	7(0.12)	11(0.13)	29(0.24)	
Stage III	0	1(0.02)	3(0.03)	11(0.09)	
Postoperative intubation(hour)	18.8±12.5	24.6±20.6	32.5±29.1	47.7±47.5	<0.001
Postoperative ICU stay (day)	1.9±1.2	2.3±1.8	2.6±1.9	3.8±3.8	<0.001
Postoperative hospitalization (day)	10.2±4.9	11.1±4.9	11.2±5.2	12.5±7.9	<0.001
Total hospitalization(day)	24.3±8.7	24.5±9.9	24.9±9.1	28.0±11.8	<0.001

**Methods:** Acute kidney injury (AKI) was defined by Kidney Disease Improving Global Outcomes (KDIGO) criteria. Glyce- mic variability was measured by Maximal blood glucose dif- ference (MGD). The MGD was analyzed as quartiles and all patients were divided into four groups. Group 1: MGD < 5.4 mmol/L, Group 2: MGD 5.4-7.1 mmol/L, Group 3: MGD 7.1-9.1 mmol/L, Group 4: MGD > 9.1 mmol/L.

**Results:** 1,426 patients underwent OPCABG were analyzed. Postoperative AKI developed in 338 patients (28.1%). The incidence of overall AKI in four groups was 22%, 22%, 29% and 40%, respectively. It was higher in group 3 to 4 than group

1 to 2 and higher in group 4 than group 3(P<0.05). The inci- dence of AKI stage II and III was higher in group 4 than Group1 to 3. The length of postoperative ICU intubation, stay and hospitalization was significantly longer in group 4 than those in the lower three MGD Groups.

**Discussion:** Increased glyce- mic variability is significantly associated with the risk of postoperative AKI after OPCABG.

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**PP:03****MANAGEMENT OF TYPE A DISSECTION IN PREGNANCY: SITE AND TEAM CAN MAKE THE DIFFERENCE**

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**Introduction:** Aortic dissection is rare in pregnancy but associated with poor maternal and neonatal outcomes. We present a case of delayed diagnosis of type A aortic dissection in pregnancy in a previously healthy woman to raise awareness and highlight the value of an integrated, multidisciplinary approach.

**Methods:** A 38-year-old, G1P0 woman was transferred to our hospital with a type A aortic dissection diagnosed at 30 weeks of pregnancy. The patient had no significant medical history and her pregnancy was uneventful. At 29 weeks gestation, however, she developed central chest pain. Her local hospital excluded a diagnosis of pulmonary embolism and discharged her home. She represented 3 days later with shortness of breath and orthopnoea. On the second day of this admission, Type A aortic dissection was diagnosed on computed tomography of the chest.

She was transferred to our hospital for access to multiple specialist services including cardiothoracic surgery and high-risk obstetrics, neonatal and adult critical care.

On arrival, an ad hoc MDT convened in the emergency department by a senior team of cardiothoracic surgeons, obstetricians, anaesthetists and neonatologists agreed immediate intervention was required. She went directly to theatres for delivery of the baby and dissection repair. Awake establishment of invasive blood pressure monitoring was followed by an opiate-based cardiostable induction of anaesthesia and intubation in a head-up position. The caesarian section was uneventful and exceptional measures to minimise blood loss were not required. The ascending aorta and hemi-arch were repaired on cardio-pulmonary by-pass with circulatory arrest time of 19 minutes without intraoperative complications. The baby was electively intubated and transferred to neonatal ICU in stable condition. Mother and baby were both extubated the following day and discharged home after a week.

**Discussion:** Acute aortic dissection should always be included in the differential of acute chest pain in pregnant women. It most commonly occurs during the third trimester or the early postpartum period and it can sometimes present in women with no previous history of aortopathy. High clinical suspicion, careful history taking and examination, CT, MRI or echocardiography can establish the diagnosis.

Optimum management to ensure the survival of both mother and fetus varies with gestational age and planning to ensure this requires a complex balance of expertise between specialties. In the third trimester, emergency delivery followed by

surgical aortic repair probably offers the best survival chances for both.

Institutions which offer senior input from multiple specialties are crucial for the timely management of these complex cases. This need for urgent intervention from outside cardiothoracic surgery in cases with multiple issues must be considered when regional care models for the management of aortic dissection cases are being designed.

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**PP:04****THE ROLE OF HIGH FIDELITY CARDIOVASCULAR SIMULATION IN ANESTHESIA TRAINING**

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**Introduction:** Simulation has become an essential element in the learning and assessment of anesthesia trainees [1]. It offers a controlled environment to explore various clinical entities and their impact on anesthesia management without the risk of harming an actual patient. Cardiac anesthesia seems to be an excellent field for simulation due to the complexity of cardiac pathophysiology. A systematic review with meta-analysis on simulation-based anesthesia training demonstrated that simulation training in anesthesia is at least as good as non-simulator training, and is much better than no intervention. [1]

Our aim was to evaluate the role of a high-fidelity cardiovascular simulation software on the anesthesia trainees' education and professional evolution.

**Methods:** We used a high-fidelity cardiovascular simulator, present at the University Hospitals Leuven, reproducing the main hemodynamic changes of the cardiovascular system [2]. For this purpose, the simulator was uploaded to a server so users could access it remotely. The simulator was used in 4 consecutive simulation sessions, awarded only for the senior (4th- and 5th-year) anesthesia specialist trainees at the

University Hospitals Leuven. Each session focused on a specific topic, namely cardiac tamponade, aortic valve, and mitral valve pathologies. The sessions were given online via zoom video communication due to Covid-19 social restrictions. The trainees initially received a short PowerPoint presentation regarding the topic, followed by hands-on training using the cardiovascular software accessible online. A short quiz was implemented at the beginning and end of the training session to assess the trainee's knowledge and progress. Furthermore, the trainees completed a satisfaction questionnaire at the end of the simulation course.

**Results:** In total, 47 anesthesia trainees attended the online simulation sessions. The trainees were markedly pleased with the format of the simulation, combining the short theoretical overview with the hands-on simulation training. Besides, they reacted positively to the simulation cases and the explanations given by the instructors. Yet, there is still room for improvement to make the simulator better accessible from remote locations. All the trainees agreed that the simulator is a valuable tool in anesthesia training, and 78,7% of them stated that the simulator promotes a better understanding of cardiovascular pathophysiology and helps develop clinical reasoning.

**Discussion:** The simulator has proven to improve knowledge of pathophysiology of the cardiac patient. The majority of trainees evaluated the simulation as a useful experience, a valuable tool for understanding the complex cardiac pathophysiology, with a good format and clear explanations by the instructors. The study has some limitation concerning sample size. To thoroughly study the effect of the use of the simulation on the trainees' progress, the sample size should be larger and a comparison should be made between a simulation group and a control group.

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**PP:05**

## CARDIOTHORACIC ANAESTHESIA LECTURE SERIES

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**Introduction:** Cardiothoracic anaesthesia is a complex and highly specific area within anaesthesia that can initially be overwhelming for new trainees. Furthermore elements of the Final FRCA examination often focus on this broad topic. We wished to create an online lecture series that was freely accessible and aligned to the RCOA anaesthetic curriculum in order

to help ease trainees into the important but potentially daunting world of cardiothoracic anaesthesia.

Cardiac Lectures	
Preassessment & Interpretation of Investigations for Cardiac Surgery	Arrhythmias
Aorta and Aortic Disease	TOE basics
Aortic Valve and Aortic Valve Diseases	Inotropes and Vasopressors
Mitral Valve and Mitral Valve Diseases	Early Complications after Cardiac Surgery
Mechanical Circulatory Support	Management of Low Cardiac Output State
Introduction to Intra-Aortic Balloon Pumping (IABP)	Anaesthesia for Heart Transplant
Bleeding and Homeostasis in Cardiac Surgery	
Thoracic Lectures	
Pre-assessment & Interpretation of Investigations for Thoracic Anaesthesia	One Lung ventilation
Anaesthesia for Thoracic Surgery	Anaesthesia for Lung Transplant

**Methods:** A team of eleven trainees and one perfusionist volunteered to produce content for the cardiothoracic anaesthesia e-learning lecture series. The educational content was carefully aligned to the RCOA and Final FRCA exam syllabus and in total 17 lectures were written. Each lecture was reviewed and edited by a consultant cardiothoracic anaesthetist before being narrated and recorded using “Panopto” software. Video lectures were hosted on the Welsh School of Anaesthesia website(1) allowing trainees to freely access the educational content at a time, place and pace that suits them.

**Results:** Currently, 13 of the 17 lectures have been produced and are available to watch online (final 4 available soon). Website analytics show that in their first ‘live’ month, each video has been viewed or downloaded up to 26 times, delivering up to 3 hours of educational content. We surveyed current trainees undertaking their cardiothoracic anaesthesia module; trainees found the lecture series “extremely helpful” for both practical anaesthesia and finals revision. All trainees would recommend these to a colleague.

**Discussion:** The production of an online series of lectures within cardiothoracic anaesthesia was planned to make learning in this area more convenient, accessible and manageable (2) with a focus on the specifics of the intermediate level RCOA curriculum. From the feedback received, we have produced a highly useful tool that will be used as an educational resource over the years to come. Engagement with the lecture series will continue to be monitored and the content will be updated on a 5 yearly basis to ensure it remains relevant and up-to-date. We hope that by making this series so accessible it has the potential to be of great use to anaesthetic trainees not just in the Wales deanery but also over the whole of the UK.

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**PP:06**

**THE INFLUENCE OF ANTIPLATELET MEDICATIONS ON INTRAOPERATIVE PATIENT BLOOD MANAGEMENT DURING ADULT CARDIAC SURGERY**

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**Introduction:** Cardiac surgery is inherently associated with increased bleeding and transfusion requirements. The increased risk of bleeding is due to multiple factors; pharmacological (Intravenous heparin and Dual Antiplatelet Therapy-DAPT), patient (advanced age, preoperative anaemia, and female gender) and surgical (Emergency and redo surgery)1. This study aimed to determine if preoperative antiplatelet medication influenced intraoperative blood and blood products requirements during elective adult Isolated Coronary Artery Bypass Graft (CABG) and valve surgery.

Table 1: Isolated CABG Vs Valve Surgery

Variable	CABG (n=20)	Valve (n=11)
Aspirin (n, %)	20/20 (100%)	5/11 (45%)
Antiplatelet (clopidogrel or Ticagrelor) (n,%)	6/20 (30%)	1/11 (9%)
Pre-op Hb (g/L)	14	13.7
Pre-op Creatinine (µmol/L)	83	89
Baseline ACT (msec)	104	103
ACT post heparin (msec)	498	494
ACT post Protamine (msec)	108	115
Hb Post CPB (g/L)	10.7	10.8

\*All figures are express in 'mean'.

Table 2: Isolated CABG Vs Valve Surgery

Variable	CABG (n=20)	Valve (n=11)	p Value
EBL (mls)	624	507	p=0.13
Red Cell units (units)	0.25	0.36	p=0.32
Octaplasma (units)	0.4	1.45	p=0.04
Fibrinogen (grams)	0	1.1	p=0.0006
Platelets (pool)	0	0.27	p=0.006

**Methods:** Methodology: A Prospective observational study carried out between September to November 2020, MMUH Ethical committee approval ref: CA20-064 on 12/10/2020. Perioperative data were collected from fifty patients. This included demographic data, preoperative laboratories, pre-Cardiopulmonary Bypass (CPB) heparin dose, Activated Clotting Time (ACT) at baseline, post heparin and post protamine, blood products transfused and estimated blood loss (EBL). The inclusion criteria applied was isolated CABG, single valve surgery and elective operation. A one-paired Student t-test performed to detect a statistical difference between the two groups (Isolated CABG Vs Single valve Surgery)

**Results:** 31 patients met the inclusion criteria. 19 patients excluded because of the following reasons: emergency surgery n=3, redo surgery n=1, New Oral Anticoagulants (NOACS) medication n= 4, combined CABG & valve surgery/other n=12. 20 patients underwent an isolated CABG, and 11 patients underwent a single valve operation. DAPT was prescribed in 30% n=6/20 and 9% n=1/11 in the CABG and Valve group respectively.

There was no statistical difference in the EBL at the end of the procedure between the two groups (CABG-624 ml Vs Valve-507 ml, p= 0.13). Intraoperative red cells transfusion between the two groups were similar, however Octaplasma, fibrinogen and platelets transfusion were higher in the valve group.

**Discussion:** DAPT were more frequently prescribed pre-operatively in patients undergoing elective CABG in comparison to single valve surgery. Pre & postoperative haemoglobin and EBL were similar between the two groups. Despite this, in the single valve surgery group (only 1 patient out of 9 received DAPT, n=1/9) received more blood products during the intraoperative period. This was statistically significant for the use of Octaplasma, Platelets and fibrinogen. Blood transfusion was not directed using ROTEM in any patients in either group. We, therefore, recommend the intraoperative use of ROTEM to guide blood transfusion for patients undergoing isolated single valve surgery.

**PP:07**

**APROTININ USE IN CARDIAC SURGERY IN A TERTIARY CENTRE IN IRELAND: CASE NUMBERS, INDICATIONS & COMPARISON TO TRANEXAMIC ACID**

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**Introduction:** Aprotinin is a serine protease inhibitor which is used in cardiac surgery as an anti-fibrinolytic agent to minimise patient bleeding. It was withdrawn from the European market in 2008 due to potential increased mortality when compared to tranexamic acid. Aprotinin was subsequently re-introduced in 2012 with narrow licencing indications, specifically isolated coronary artery bypass graft surgery in high risk patients. Minimisation of intra-operative blood loss plays an important role in patient outcomes, especially in decreasing the need for transfusion which carries its own mortality risks(3,. Tranexamic acid is utilised in the majority of cardiac surgery cases throughout Europe. We looked to quantify and determine indications for aprotinin usage in an Irish tertiary cardiac centre and compare findings to tranexamic acid.

**Methods:** Retrospective study of aprotinin usage in cardiac surgery in an Irish tertiary centre over a 3 year period to determine number of cases and indications. Data collection involved operative notes, patient records, pharmacy dispensing accounts. Aprotinin dosage intra-operatively was per the full or half Hammersmith protocol. A cohort which had undergone comparable cardiac surgery procedures with tranexamic acid as the anti-fibrinolytic agent were also studied.

**Results:** From 2018-2021, 21 cardiac surgeries were carried out using aprotinin as the sole anti-fibrinolytic agent to minimise patient bleeding in a high risk cohort. For the same time period, to provide scale, 737 cardiac surgeries were carried out using



tranexamic acid. Each of the cases which utilised aprotinin represents an emergent, life-threatening operation. The emergency cases comprised: repair of Stanford type A aortic dissection (8, 38%); aortic valve replacement (7, 33.3%); mitral valve replacement (3, 14.3%); tricuspid valve replacement (1, 4.8%); mediastinal revision for cardiac tamponade (1, 4.8%). Valve replacements were complicated by: acute infective endocarditis, aortic root abscess, haematoma, failure of pre-existing prosthetic valves. 1 case utilised aprotinin as per the licenced indication: isolated CABG in patient with high bleeding risk. An ST-elevated myocardial infarction necessitated the emergency CABG procedure in this case.

**Discussion:** In summation, 95% of aprotinin usage for cardiac surgery in an Irish tertiary centre falls outside the remit of the licenced indication. Given similar findings in a number of European institutes(5), is it time to re-assess the existing guidelines on aprotinin use, with view to expansion of the licenced indications?

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PP:08

## DEXMEDETOMIDINE IN CARDIAC SURGERY

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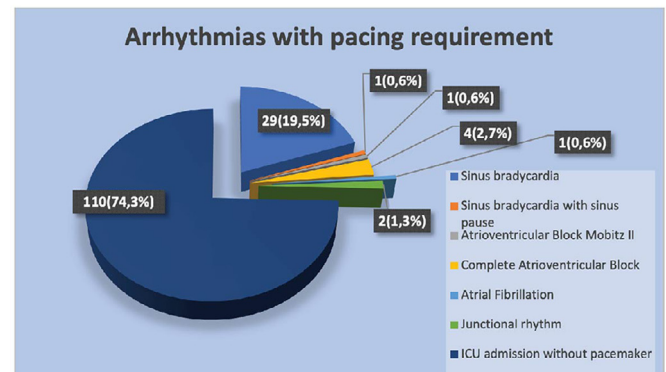
**Introduction:** Dexmedetomidine is an alpha 2 agonist drug with several theoretical benefits supported in the literature for cardiac surgery including a decrease of mortality (1, 2); however, many anesthesiologists restrict its use due to side effects such as disturbances of the cardiac conduction system. Therefore, it is important to describe the rhythm alterations associated with the use of dexmedetomidine in the postoperative period of cardiac surgery, and its impact in the postoperative

course of this patient population. The following study pretend to describe the frequency of appearance of Atrial Ventricular Blocks related to the intraoperative use of dexmedetomidine in patients undergoing cardiovascular surgery.

Table 1. Frequency of Bradyarrhythmia

Bradyarrhythmia documented in diagnostics	Onset time of bradyarrhythmia							Total
	Medical History of arrhythmias	During Surgery	Hours after discontinue dexmedetomidine			Onset of arrhythmia within half-life time	Onset of arrhythmia outside half-life time	
			4 hours	4-24 hours	24 hours or more			
Sinus bradycardia (%)	0 (0)	30(20,7)	1(0,6)	2(1,2)	2(1,2)	31(20,9)	4 (2,6)	35(23,6)
First-degree atrioventricular block (%)	2 (1,2)	0(0)	0(0)	0(0)	2(1,2)	0(0)	2(1,2)	2 (1,2)
Sinus bradycardia and First-degree atrioventricular block (%)	0(0)	4(2,7)	0(0)	0(0)	0(0)	4(2,7)	0(0)	4(2,7)
Complete atrio ventricular block (%)	0(0)	3(2)	1(0,6)	0(0)	1(0,6)	4(2,7)	1(0,6)	5(3,3)
Nodal rhythm (%)	0(0)	1(0,6)	0(0)	0(0)	1(0,6)	1(0,6)	1(0,6)	2(1,2)
Intermittent junctional rhythm (%)	0(0)	1(0,6)	0(0)	1(0,6)	0(0)	1(0,6)	1(0,6)	2(1,2)
Sinus bradycardia and sinus pause (%)	0(0)	1(0,6)	0(0)	0(0)	0(0)	1(0,6)	0(0)	1(0,6)
Total						42(31,2)	9(6)	51(35,3)

Graph 1. Patients with pacemakers on admission to the ICU and indication for pacing.



**Methods:** After IERB approval of a cross sectional descriptive study. All patients undergoing cardiac surgery under general anesthesia with dexmedetomidine 0.5mcg/kg/h from anesthesia induction to the case end, that were done between 2015 and 2019 at the center were included. Most data were taken from anesthesia and intensive care unit medical records. Standard demographic variables were collected, frequency measures were established for relevant events such as bradyarrhythmias, and their frequency was described according to severity and need for intraoperative and postoperative intervention.

**Results:** 148 patients who underwent simple or combined surgical procedures were included in the study; the prevalence of atrioventricular blocks was 6%, according to its severity, first degree blocks were reported in 2.7%, second degree blocks were reported in 0.6% and complete blocks were reported in 2.7%. Bradyarrhythmias associated with the use of dexmedetomidine varies between 24.2% - 28.2% (period) depending on the time of diagnosis (Table 1). According to its severity, sinus bradycardia varies between 20.1% - 24.32%, and nodal rhythm 0.6% - 1.2%. 25.6% of the patients required transient postoperative pacemakers, 1.2% of the patients required a permanent pacemaker (Chart 1). The most frequent tachyarrhythmia was atrial fibrillation in 14.8%. An overall mortality of 2% was reported.

**Discussion:** The use of dexmedetomidine predisposes to an increase in the presentation of sinus bradycardia in the immediate postoperative period of cardiovascular surgery compared to that reported in the literature, without increasing the prevalence of atrioventricular blocks.

There is a greater tendency to use an epicardial pacemaker during the intraoperative period, which for the most part was not necessary in the immediate postoperative period. There is a decreasing trend in the presentation of atrial fibrillation as described in previous studies. There is no increase in the mortality of these patients compared to local and international reports.

Prospective studies are required to verify the exploratory findings of this study and judge its benefits against the development of bradyarrhythmias in this patient population.

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#### PP:09

### IS THE SWAN-GANZ CATHETER EXCLUSIVELY A TOOL FOR PRESSURE MEASUREMENTS INSIDE THE PULMONARY CIRCULATION? THE MECHANICAL CONTRIBUTION OF THE PULMONARY ARTERY CATHETER TO A CRITICAL DECISION MAKING INTRAOPERATIVELY

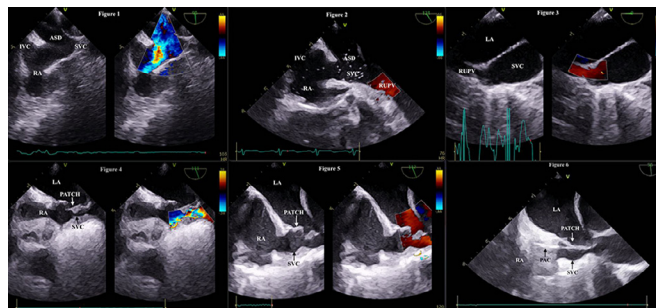
Konstantinos Lolakos<sup>1</sup>, Nikolaos Tsotsolis<sup>1</sup>, Antonios Pitsis<sup>1</sup>, Nikolaos Nikoloudakis<sup>1</sup>, Anda-Cristina Butnar<sup>2</sup>, Timotheos Kelpis<sup>1</sup>, Isaak Keremidis<sup>1</sup>

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**Introduction:** The Pulmonary Artery Catheter (PAC) Swan-Ganz, despite the widespread rumours regarding the possible complications that correlate with its insertion, such as the pulmonary artery rupture, is still - in the experienced hands - an essential tool of hemodynamic monitoring in cardiac surgery. In combination with Transoesophageal Echocardiography (TOE) though, they offer to the Anaesthesiologist an integrated profile of pressure, volume, flow velocity and anatomical information. However, there can still be occasions where the above mentioned hemodynamic and non-hemodynamic data are not enough to guide the surgical decision-making process intraoperatively. In this case report, we present the contribution of the difficulty in advancing

the PAC into the Right Atrium (RA), as an indication of Superior Vena Cava (SVC) stenosis, and the need to return to CardioPulmonary Bypass (CPB) to repair it, during a surgery of totally endoscopic Atrial Septal Defect (ASD) closure.



**Methods:** A 40yr old female patient is undergoing totally endoscopic cardiac surgery with CPB for the closure of a Superior Sinus Venosus ASD with simultaneous anomalous drainage of the Right Upper Pulmonary Vein (RUPV) into the SVC. The anaesthetic monitoring includes arterial line, PAC and TOE, which confirms the preoperative findings (Figure 1,2,3), while for the needs of the operation the Anaesthesiologist inserts also a CPB cannula in the Right Internal Jugular Vein. Later on, during the phase that the surgeon is advancing the second venous CPB cannula through the femoral vein and the Inferior Vena Cava (IVC) into the RA, the PAC is being withdrawn from its wedge position and is left high inside the SVC, showing the Central Venous Pressure (CVP).

**Results:** After the closure of the ASD and the flow diversion of the RUPV into the Left Atrium with a bovine pericardial patch, deairing is taking place, the restoration of the ASD is being confirmed with the TOE and successful CPB weaning occurs. A subsequent TOE scan shows turbulence inside the SVC with the colour Doppler (Figure 4), indicative of stenosis, while the CVP is 15mmHg, and the dilemma that is coming up is if the stenosis is clinically significant or not. However, at the same time it is impossible to readvance the PAC into the RA, an indication of severe SVC stenosis, and the team decides to return to CPB to repair it. After the placement of a second pericardial patch that widens the RA-SVC junction on a beating heart, laminar flow is being depicted inside the SVC (Figure 5), the PAC is being seamlessly floated into the RA (Figure 6) until its wedge position, and the CVP is 8mmHg. The short and the long-term postoperative periods were uncomplicated.

**Discussion:** The intraoperative use of the PAC in the current case report, and the difficulty in readvancing it more specifically, proved to be crucial in making an undoubtedly critical decision towards repairing a stenosis that could have been overlooked, if we had simply relied on the CVP, and become even fatal in case of delayed diagnosis. The mechanical contribution of the PAC has been underlined.

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## PP:10

### APROTININ USE IN HIGH-RISK CARDIAC SURGERY: RECENT INSIGHTS FROM THE BELGIAN APROTININ PATIENT REGISTRY

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**Introduction:** In 2007, the use of aprotinin was temporarily suspended following several publications raising serious safety concerns.(1,2,3) However, Canadian and European Health Authorities concluded that these studies suffered from major flaws and lifted the suspension in 2013.(4,5)

The reintroduction of aprotinin in 2016 was accompanied by a mandatory registry [Nordic Aprotinin Patient Registry (NAPaR)] in order to monitor the pattern of use, the effect of risk minimization measures, and overall safety.

Objective of this study was to analyse the use of aprotinin in Belgium.

**Methods:** NAPaR is a non-interventional Post-Authorisation Safety Study (PASS), endorsed by the Pharmacovigilance Risk Assessment Committee of the European Medicine Agency.

**Results:** Between October 2018 and August 2020, six Belgian NAPaR centers included 694 patients [median age 70 (range 13-90y); 62% male; median EuroSCORE II 4.6 (range 0.5-93.4)]. 25% of the patients had an EuroSCOREII > 10.

57% of the patients were under an active antiplatelet therapy and 17% were treated with novel oral anti-coagulants. Preoperative renal impairment was present in 2/3 of patients.

Only 4% of the patients received aprotinin on-label, i.e. for isolated coronary artery bypass grafting (CABG) on cardiopulmonary bypass (CPB).

In 96% of the patients, aprotinin was used off-label, mainly for redo surgery (32%), CABG + valve surgery (29%), aortic surgery (20%) and multiple valve surgery (17%). One third of the procedures were urgent (23%) or emergent (9%). Median bypass time was 128min (range 13-600min).

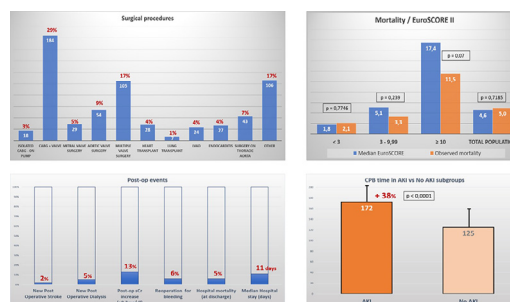
Median hospital stay was 11 days (range 3-151 days).

Main reported indications for the use of aprotinin were active dual antiplatelet therapy (68% in iCABG), redo surgery (16%) and expected prolonged CPB time (55%).

In 83% of the cases, aprotinin was administered at the Half Hammersmith dose (1 Mio KIU loading- and priming-dose + 250.000 KIU/h); most patients received the appropriate test dose (98%), none developed anaphylactic reactions.

Median perioperative blood loss was 400ml (range 40 -10050 ml), 44% of the patients had RBC transfusion and 6% underwent reoperation for bleeding or tamponade.

Overall mortality at discharge was 5%, i.e. within the range or lower than predicted by the EuroSCORE II. 2% of the patients had a postoperative stroke. Postoperative AKI as defined by a serum creatinine increase of 0,3mg/dL or more within 48 hours after surgery was present in 13% of cases. Most of these patients (76%) suffered from preoperative moderate or severe renal impairment including dialysis. Notably, in patients with postoperative AKI median CPB time was significantly higher than in patients without AKI: 172min (range 56-402) vs 125min (range 13-600min) (p<0.0001).



**Discussion:** In the Belgian centers, aprotinin was mainly used off-label and predominantly administered to older patients with significant comorbidities undergoing high-risk procedures. The observed safety outcomes are in line with published data within this high risk patient population.

The data from the Belgian NAPaR suggest that aprotinin has an excellent safety profile in adult cardiac surgery.

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## PP:11

### EFFECTS OF ULTRASOUND-GUIDED BILATERAL THORACIC PARAVERTEBRAL NERVE BLOCK COMBINED WITH GENERAL ANESTHESIA ON BRIDGING VASCULAR FLOW IN OFF-PUMP CORONARY ARTERY BYPASS GRAFTING: A SINGLE-CENTER RANDOMIZED CONTROLLED STUDY

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**Introduction:** To investigate the effect of bilateral thoracic paravertebral nerve block (BTPVB) combined with general anesthesia on bridging vascular flow in OPCABG.

**Methods:** Fifty patients were randomly divided into two groups randomly: BTPVB combined with general anesthesia group (T group, n=20) and general anesthesia group (G group, n=30). Before anesthesia induction, the patients in group T underwent bilateral thoracic paravertebral space puncture through T4-5 space. The experimental dose of 1% lidocaine 5 ml was injected on both sides, and the first dose of 0.375% ropivacaine 15 ml was given 2 minutes later. Primary Outcome Measures: Immediate flow and pulse index of bridge vessels were recorded in both groups. Secondary Outcome Measures: Dosages of intraoperative anesthetic drugs were recorded in both groups. After the placement of the floating catheter (T1), after the sternotomy (T2), after the completion of anastomosis of all bridging vessels (T3), and before the exit of the chamber (T4), HR, MAP, CVP, MPAP, CCO, SVRI and PVRI were recorded.

**Results:** The level of pain block after BTPVB in T group was 5.1 and 0.6 segments, as shown and G group, and CVP at T3 and T4 in T group SVRI and PVRI were significantly decreased ( $P < 0.05$ ), and CCO was significantly increased ( $P < 0.05$ ). Compared with group G, the incidence of tachycardia in the operation center in group T was significantly decreased ( $P < 0.05$ ), the incidence of hypotension and the use rate of noradrenaline were significantly increased ( $P < 0.05$ ), and the intraoperative sufentanil in group T was significantly decreased ( $P < 0.05$ ). Compared with group G, after OPCABG, the blood flow of the lima-lad bridge in group T was significantly increased ( $P < 0.05$ ), and the vascular pulse index of the bridge was significantly decreased ( $P < 0.05$ ).

**Discussion:** BTPVB combined with general anesthesia has obvious analgesic effect significantly increased the vascular flow of the left internal thoracic artery bridge and decreased the vascular pulse index of the left internal thoracic artery bridge after OPCABG.

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**PP:12**

## ANESTHESIA MANAGEMENT OF PATIENTS UNDERGOING PERCUTANEOUS PULMONARY VALVE IMPLANTATION

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**Introduction:** To investigate the perioperative anesthesia management of percutaneous pulmonary valve implantation (PPVI).

**Methods:** Clinical data of 6 patients undergoing PPVI operation were retrospectively analyzed in children's heart center of Henan Provincial People's Hospital from December 2017 to January 2020, including 3 males and 3 females with mean age ( $16.3 \pm 5.4$ ) years, weight  $41.2 \pm 12.3$  Kg. All patients received endotracheal intubation under general anesthesia. Systolic blood pressure (SBP) and diastolic blood pressure (DBP), heart rate (HR), central venous pressure (CVP), pulse oxygen saturation (SPO<sub>2</sub>) were recorded before anesthesia induction (T1), after anesthesia induction (T2), before surgery (T3), before percutaneous pulmonary valve implantation (T4), during percutaneous pulmonary valve implantation (T5), after percutaneous pulmonary valve implantation (T6) and out of the operating room (T7). Right ventricular systolic (SRVP) and right ventricular diastolic (DRVVP), pulmonary artery systolic (SPAP) and diastolic (DPAP) were recorded before T4 and after T6. Intraoperative complications were recorded. The time of tracheal catheter removal was recorded. The time of stay in ICU and the time of discharge was recorded.

**Results:** Compared with T1, T2, T3, T4, T6, T7, SBP, DBP, HR and SPO<sub>2</sub> was significantly reduced at T5 ( $P < 0.05$ ). Compared with



T1,T2,T3,T4,T5, CVP was significantly reduced at T6 and T7 ( $P<0.05$ ). Compared with T4, Right ventricular diastolic pressure (DRVP) was significantly reduced and pulmonary artery diastolic pressure (DPAP) was significantly increased at T6 ( $P<0.05$ ). All patients were able to tolerate general anesthesia. One patient was transferred directly to the ward without any complications related to anesthesia and surgery. Five patients were transferred to ICU and 6 patients were discharged successfully.

Table 1 Hemodynamic changes during perioperative period of pulmonary valve implantation (n=6,x±s)

	T1	T2	T3	T4	T5	T6	T7
SBP (mmHg)	115.3±10.5	109.6±8.3	101.4±7.8	102.5±6.5	51.5±3.8*	117.2±10.6	105.6±9.8
DBP (mmHg)	61.3±5.6	55.6±5.1	54.1±5.3	53.7±5.7	32.6±2.9*	61.3±5.7	63.5±5.3
HR (time/min)	65.1±5.3	63.5±5.6	63.1±5.7	63.5±5.3	51.5±7.6*	68.3±3.9	71.3±4.3
CVP (mmHg)	12.3±2.5	11.6±2.3	12.1±2.6	12.5±2.8	13.7±3.3	8.5±1.7*	8.6±1.9*
SPO2(%)	93.6±2.1	98.1±1.7	97.6±1.4	98.5±1.6	75.6±3.5*	97.5±1.8	98.6±1.6
SVRP (mmHg)				38.5±3.6		37.6±3.1	
DVRP (mmHg)				4.7±1.1		3.1±0.6*	
SPAP (mmHg)				35.3±2.5		33.7±2.1	
DPAP (mmHg)				3.7±0.7		5.6±1.3*	

T1: Preanesthesia induction T2: After induction of anesthesia T3: Before surgery T4: Pulmonary valve before implantation T5: The pulmonary valve is implanted. T6: Pulmonary valve placement T7: leaving the operating room  
SBP: Systolic blood pressure DBP: Diastolic blood pressure HR: Heart rate CVP: Central venous pressure SPO2: Pulse oxygen saturation SVRP: Right ventricular systolic pressure DVRP: Right ventricular diastolic pressure SPAP: Systolic pulmonary artery pressure DPAP: Diastolic pulmonary artery pressure

Table 2 Perioperative conditions of pulmonary valve implantation (n=6,x±s)

Dopamine use	Arrhythmia	Exubation time (h)	ICU Stay(h)	Discharge time(d)
66.7% (4/6)	83.3%(5/6)	10.5±2.3	21.5±3.7	17.6±5.6

**Discussion:** Tracheal intubation general anesthesia is suitable for percutaneous PPVI surgery. Hemodynamic monitoring should be strengthened during pulmonary valve implantation to maintain circulatory stability.

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## PP:13

### PERIOPERATIVE ANTIBIOTIC PROPHYLAXIS IN CARDIAC SURGERY. WHAT SHOULD WE KNOW?

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**Introduction:** Perioperative antibiotic prophylaxis has proved to reduce the number of postoperative infections. In cardiac surgery, the infections in the surgical site are found to be around 0.4-4%. The most common bacteria causing surgical site infections in cardiac surgery are gram-positive.

Our aim in to guide the reader in the decision of choosing the most adequate Perioperative Antibiotic Prophylaxis in each patient according to their characteristics and their environment.

**Methods:** The most recent bibliography was reviewed searching the most common antibiotics used in perioperative Antibiotic Prophylaxis in cardiac surgery. A bibliographic search was carried out in the PubMed-MEDLINE database. A peer review was performed and a total of 4 references of more than 30 were selected.

**Results:** There is no difference in the Surgical Site Infections between the use of 1st generation of Cephalosporin or Glycopeptides such as Vancomycin or Teicoplanin. On the other hand, 1st generation of Cephalosporin reduces the incidence of infections produced by Staphylococcus. Nevertheless, Glycopeptides are better at avoiding infection produced by Staphylococcus and Enterococcus resistant than Cephalosporin.

**Discussion:** Choosing Perioperative Antibiotic Prophylaxis must be individualized according to the bacterial flora in the environment, the different characteristics of the patients, and the type of cardiac surgery. Also, a high incidence of Staphylococcus Aureus methicillin-resistant must receive prophylaxis with Vancomycin and a second antibiotic should be considered.

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## PP:14

### IS A HIGH HEMATOCRIT USEFUL TO REVEAL AN EARLY REEXPANSION PULMONARY EDEMA?

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**Introduction:** The Reexpansion Pulmonary Edema (RPE) is a rare condition, lethal in 20%, resulting after a fast drainage of pleural effusion, pneumothorax or a huge mediastinal mass. We report a case of RPE after treatment for pleural effusion. Beside typical symptoms as hyponatremia, hyperkalemia, hyperglycaemia, an interesting finding was a high haematocrit value (>65%), never described. We want to stress the importance of early recognition of signs and symptoms: inadequate or delayed treatment may lead to a fatal outcome.

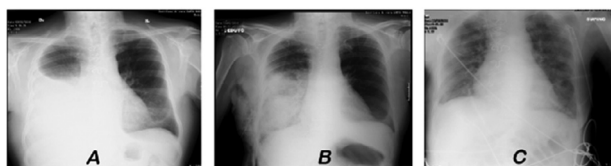
**Methods:** After two months from a cardiac revascularization, a 68-year-old male patient was re-admitted for respiratory failure (SpO<sub>2</sub><90%). Chest X-ray revealed a large right pleural effusion (Fig.1A). Thoracentesis was performed with a thoracic drainage, resulting in two aspirations (twenty minutes separated) for a total of 2100 ml of transudative fluid. The patient was stable but the exams showed a high value of haematocrit (65%) with hyponatremia (125 mmol/L). After two hours, the patient showed haemodynamic instability, dyspnoea and respiratory failure. A repeated radiography showed signs of severe pulmonary edema on the right side (Fig.1B). Non-invasive ventilation was useless, so the patient was transferred to the ICU, intubated and ventilated in Mandatory minute ventilation mode (MMV): tidal volume 8 ml/kg, FiO<sub>2</sub> 50%, PEEP 5 cmH<sub>2</sub>O, PS 15 cmH<sub>2</sub>O. Post-intubation, the patient showed a mixed acidosis with hyponatremia, hyperkalemia, hyperglycaemia and a high haematocrit value persistency (65%). The echocardiography showed the absence of pericardial effusion, severe hypovolemia, ejection fraction 45%. Therapy included: rehydration using sodium solutions, correction of hypoalbuminemia and hyperglycaemia, MMV for 24 hours with progressive improvement in gas exchange, haematocrit normalization (46% as

preprocedure value) and electrolytical improvement (130 mmol/L),(Tab.1). The instability required the infusion of adrenaline (0.05 mcg/kg/min) and norepinephrine (0.1 mcg/kg/min), progressively reduced and suspended on the second day.

**Results:** The pulmonary edema diminished gradually and the patient was extubated after one day: the haematocrit was 42%. The radiography showed a reduction of edema (Fig.1C). At third day, the patient was discharged to the ward.

**Discussion:** Recently Meeker<sup>1</sup> defined RPE “an uncommon complication of a common clinical scenario” with an unclear pathophysiology. Age, clinical status, rapid thoracentesis or chest drainage are important risk factors for this rare iatrogenic complication. Literature shows a removing volume of 1200-1800 ml as a safe cut-off. This process, resulting in local and systemic factors, starts with an acute lung reexpansion and consequently insurgence of pulmonary edema, related to the hydrostatic forces on pulmonary capillaries: the return of high perfusion pressure after rapid thoracentesis or chest drainage is associated with negative pressure and vessel hypoxic constriction. This reperfusion increases free oxygen radicals and anoxic stress resulted in the production of cytokines by the endothelium: selectin, TNF- $\alpha$  and IL-1 $\beta$ , generating increased protein permeability. We assume that the drop in osmotic pressure causes the leakage of liquids into the extracellular space leading to a rapid increase in the haematocrit value associated to hyponatremia: these early alerts can help the staff to avoid a rapidly worsening of respiratory function and to start a correct treatment.

Fig. 1 - Radiographic assessment at the admission (A), Repeated chest X-ray showed signs of severe pulmonary oedema on the right side (B) and Repeated chest X-ray showed signs of a reduction of oedema at the discharge (C):



Tab.1 - Blood gas control panel

	Pre Intubation	Post Intubation		Post Extubation
		(after 2 hours)	(after 24 hours)	
pH	7.43	7.28	7.36	7.44
pO <sub>2</sub> (mmHg)	62	71	152	100
pCO <sub>2</sub> (mmHg)	34	47	31	32
Na <sup>+</sup> (mmol/L)	125	124	134	141
K <sup>+</sup> (mmol/L)	5.1	5.5	4.3	3.9
Glu (mg/dL)	292	301	169	97
Lac (mmol/L)	3.2	3.8	3.7	1.1
Hct (mmol/L)	>65	>65	46	42
HCO <sub>3</sub> (mmol/L)	22.6	22.1	17.5	21.7
BE (mmol/L)	-1.7	-4.8	-7.9	-2.5

Glu = Glucose; Lac = Lactates; Hct = Hematocrit; BE = Base Excess;

**References:** 1. Meeker, Journal of CHI Medicine Perspectives 2016

**PP:15****THROMBECTOMY FOR ACUTE EMBOLIC STROKE FOLLOWING HEART SURGERY**

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**Introduction:** Acute ischaemic stroke occurs in approximately 1-10% of patients undergoing cardiac surgery and can markedly impair recovery (1). Thrombolysis carries an unacceptably high risk of haemorrhage in the early postoperative period after heart surgery. Mechanical thrombectomy is becoming an increasingly preferred alternative to treat ischaemic strokes, and unlike thrombolysis, is not contraindicated in the early postoperative period. We report a patient who had witnessed onset of ischaemic stroke in the early postoperative period after aortic valve replacement (AVR) and coronary artery bypass grafting (CABG) surgery and was treated with mechanical thrombectomy.

**Discussion:** An 81-year-old male patient underwent elective tissue AVR and CABG (internal mammary to left anterior descending coronary artery) surgery. Surgery was uncomplicated and following weaning from mechanical ventilation, the patient's trachea was extubated on the evening of surgery. His recovery progressed uneventfully and on the day after surgery, he was moved to a high dependency unit. On the morning of the second post-operative day, the patient had a witnessed rapid deterioration in conscious level, becoming unresponsive with a divergent gaze. Urgent plain CT scan of the brain showed hyperattenuation of the left middle cerebral artery (MCA) territory consistent with acute thrombosis. The patient was granted emergency funding for a mechanical thrombectomy and was transported to the regional neurology hospital. A mechanical thrombectomy was performed successfully, with digital subtraction angiography (DSA) confirming complete occlusion of the left MCA with poor collateral cross flow. The patient failed to recover neurological function and died approximately 24 hours later.

Mechanical thrombectomy is now a well-established treatment for acute ischaemic stroke. There are clear advantages with regard to functional outcome for patients undergoing mechanical thrombectomy versus best available medical therapies such as thrombolysis (2). A recent systematic review of acute ischaemic stroke post cardiac surgery showed that 50% of patients who underwent endovascular mechanical thrombectomy had a full or good neurological recovery, 36% had moderate recovery and 14% had little improvement (1). Factors that may have led to a poor outcome in this patient's case included the delay in hospital transfer, the poor cerebral cross blood flow noted on DSA and extensive comorbidities.

In conclusion, although there are many reports of mechanical thrombectomy being associated with a good neurological outcome from acute ischaemic stroke associated with cardiac

surgery, outcome may not be improved if there is underlying cerebrovascular disease and intervention is delayed.

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**PP:16****WHOLE BODY PERFUSION STRATEGY FOR AORTIC ARCH REPAIR UNDER NORMOTHERMIA AND BEATING HEART TECHNIQUE IN PEDIATRIC PATIENTS. THREE CLINICAL CASES**

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**Introduction:** The incidence of aortic arch pathology in older children is rare. Most often this occurs as a result of a previous aortic arch operation and less often it could be detected primarily. Previously, we successfully used normothermic perfusion during neonatal aortic arch repair. In this paper we evaluate the effectiveness of the method of selective whole body perfusion with coronary perfusion on the beating heart during aortic arch reconstruction in older children.

**Methods:** Between October 2019 and February 2021, 3 children underwent aortic arch surgery at our institution using the defined protocol. During the cardiopulmonary bypass (CPB), antegrade cerebral perfusion (ACP), antegrade coronary perfusion on beating heart and distal retrograde femoral aortic perfusion at a constant blood temperature 36 C were used. During the surgery, cerebral and visceral perfusion were monitored using near-infrared spectroscopy (NIRS) and transcranial dopplerography, electrocardiography and arterial blood gases. The data was collected prospectively.

**Results:** Patient one. Male, 6 years old, 27 kg. Elective admission. Diagnosis: Aortic arch hypoplasia. Surgery: Aortic arch reconstruction.

CPB: Normothermic. Selective ACP, antegrade coronary perfusion on beating heart and distal retrograde femoral aortic perfusion. Flow 2,5 l/min. CPB time – 78 min, ACP – 44 min. BCA cannula – 14 fr, coronary cannula – 4fr, femoral artery cannula – 10 fr. Ultrafiltration during CPB.

Mechanical ventilation - 18 hours post/op. Blood lactate 6 hours post/op – 1,8 mmol/l.

ICU admission – 24 hours. Hospital discharge 12 days.

Patient two, 17 y.o., 38 kg. Elective admission. Diagnosis: Aortic arch hypoplasia. The history of coarctation of the aorta surgery. Surgery: Aortic arch reconstruction.

CPB: Normothermic. Selective ACP, antegrade coronary perfusion on beating heart and distal retrograde femoral aortic perfusion. Flow 2,5 l/min. CPB time – 136 min, ACP time – 54 min. BCA cannula – 14 fr, coronary cannula – 4fr, femoral artery cannula – 15 fr. Ultrafiltration during CPB.

Mechanical ventilation – 4 hours post/op. Blood lactate 6 hours post/op – 2,6 mmol/l. ICU admission – 16 hours. Hospital discharge 17 days.

Patient three. Female, 4 years old, 15 kg. Admitted urgently. Diagnosis: Critical aortic arch stenosis. Brachiocephalic artery (BCA) and left common carotid artery (LCCA) stenosis. The history of coarctation of the aorta surgery. Low ejection fraction.

Surgery: Aortic arch, BCA and LCCA repair.

CPB: Normothermic. Selective ACP, antegrade coronary perfusion on beating heart and distal retrograde femoral aortic perfusion. Flow 3 l/min. CPB time – 107 min, ACP – 68 min. BCA cannula – 12 fr, coronary cannula – 4fr, femoral artery cannula – 12 fr. Ultrafiltration during CPB.

Mechanical ventilation - 44 hours post/op. Blood lactate 6 hours post/op – 1,6 mmol/l.

ICU admission – 5 days. Hospital discharge 26 days.

During surgery, laboratory and instrumental parameters were within reference values.

Patients had no neurological deficiency during hospital stage.

**Discussion:** These clinical cases show that the whole-body perfusion with coronary perfusion on beating heart provide safe conditions during aortic arch surgery in children using normothermia. Using this protocol, we were able to eliminate risk factors: circulatory arrest, hypothermia, cardioplegia, extended

## PP:17

### CASE SERIES OF SEVERE ACCIDENTAL HYPOTHERMIC CARDIAC ARREST TREATED SUCCESSFULLY WITH CARDIOPULMONARY BYPASS IN A UNIVERSITY HOSPITAL IN UNITED KINGDOM

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**Introduction:** Accidental hypothermia is unintentional decrease in body temperature below 35°C. Severe hypothermia is when temperature drops below 28°C and have a high mortality rate.

**Methods:** Case 1

A 48 year old man suspected CVA fall into freezing canal. He was clinging on the side of canal. He developed cardiac arrest

when retrieved by crew. Three unsuccessful shocks administered. His temperature was 21° C in ED. A midline sternotomy performed and CPB achieved. He was slowly rewarmed and acidosis corrected. When temperature was 27.5° C, internal DC Cardioversion delivered, reverted him to sinus rhythm. He was successfully weaned of CPB. Total CPB time was 4 hours and 38 min. The patient was extubated next day. He had mild dysarthria and expressive dysphasia. He was discharged to stroke unit on day 3 and improved after stroke rehabilitation.

#### Case 2

A 53 year old female, with previous history of mental illness, found unresponsive adjacent to reservoir, with weighted bag and ankles tied with chains and padlocks. She had cardiac arrest and temperature recorded as 14.1°C. She was airlifted to ED. Initial ABG pH 7.23, Lactate 2.5 and K of 4.0. No shockable rhythm achieved. She was profoundly coagulopathic with INR > 10, APTT ratio > 5 and Fibrinogen level < 0.35.

A femoro-femoral bypass was done. She was slowly rewarmed, coagulopathy and acidosis corrected. She was severely vasoplegic and developed pulmonary oedema. At temperature of 28°C, developed sinus rhythm. She was successfully weaned off CPB after six hours with high doses of vasopressors.

She developed TRALI and was ventilated for 12 days. She was confused, withdrawn and non-engaging with staff, with no focal neurological signs and a normal EEG. She received mental health support and rehabilitation and was discharged to a mental health unit on day 30.

**Results:** Severe accidental hypothermia is associated with high mortality rate ranging from 30-80% [1]. The neurological outcomes of the survivors are usually good, when the reason for cardiac arrest is not asphyxia. There are retrospective observational studies suggesting prognostic indicators which may predict survival on admission to hospital. Hyperkalemia, pH < 6.5, ACT > 400, increased ammonia levels and raised PaCO<sub>2</sub> are bad prognostic indicators.

A study by Eich et al showed that early initiation of basic life support, hypokalemia, female gender and slow rewarming to be indicators of superior outcomes. CPB is recommended for hypothermic patients in arrest and for patients with core temperatures lower than 25°C. CPB and ECMO has encouraging survival rate of upto 63%. CPB ensures controlled gradual increase in core body temperature and adequate tissue oxygenation.

**Discussion:** This case series demonstrates successful recovery with good neurological outcome from severe accidental hypothermic cardiac arrest with CPB in our institution over one year period. For severe hypothermia, CPB is extremely useful treatment device. The prognostic indicators are unclear and more evidence is required.

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**PP:18****WHOLE BODY NORMOTHERMIC PERFUSION STRATEGY FOR AORTIC REPAIR IN ADOLESCENT WITH CHRONIC AORTIC DISSECTION**

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**Introduction:** The incidence of aortic dissection in children is rare. Most often this occurs as a result of a previous aortic arch operation and less often it could be detected primarily. Previously, we successfully used normothermic perfusion during neonatal aortic arch repair. In this paper we evaluate the effectiveness of the method of selective whole-body perfusion during aortic arch reconstruction in older children.

**Methods:** In November 2020, we performed a reconstructive aortic arch surgery at our institution using the defined protocol. During the cardiopulmonary bypass (CPB), antegrade cerebral perfusion (ACP), distal retrograde femoral aortic perfusion at a constant blood temperature 36 C and cardioplegia. During the surgery, cerebral and visceral perfusion was monitored using near-infrared spectroscopy (NIRS) and transcranial dopplerography, electrocardiography and arterial blood gases. The data was collected prospectively.

**Results:** Female patient, 15 y.o., 60 kg. Elective admission. Diagnosis: Chronic aortic dissection, DeBakey type I. The history of patient ductus arteriosus surgery (1 y.o.).

**Surgery:** Ascending aortic aneurysm resection and supracoarotary aortic arch reconstruction using vascular graft. CPB: Normothermia. Cardioplegia: Custodiol. ACP and distal retrograde femoral aortic perfusion. Flow 2,5 l/min. CPB time – 186 min, ACP time – 89 min. BCA cannula – 16 fr, femoral artery cannula – 15 fr. Ultrafiltration during CPB. Mechanical ventilation – 3,5 hours post/op. Blood lactate 6 hours post/op – 3 mmol/l. ICU admission – 18 hours. Hospital discharge 15 days. During surgery, laboratory and instrumental parameters were within reference values. The patient had no neurological deficiency during hospital stage. Stenting of thoracic and abdominal aorta is planned further.

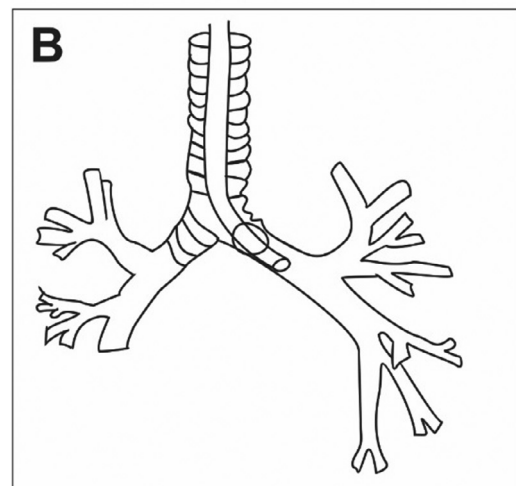
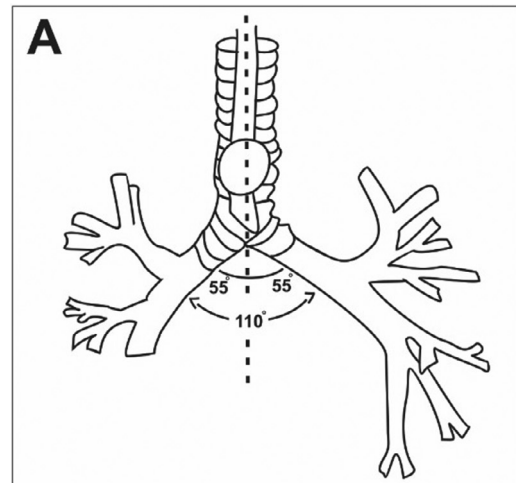
**Discussion:** This clinical case shows that the whole-body perfusion provide safe conditions during aortic arch surgery in children using normothermia. Using this protocol, we were able to eliminate a lot of risk factors: circulatory arrest, hypothermia, extended CPB time and reperfusion injury.

**PP:19****A HOLISTIC LUNG RECRUITMENT TECHNIQUE IN PEDIATRIC PATIENTS WITH CONGENITAL HEART DISEASES**

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**Introduction:** Pediatric patients with congenital heart disease suffer from respiratory problems owing to increased airway mucin production, intrinsic airway instability, tracheomalacia, bronchomalacia or due to extrinsic compression of airway caused by dilated pulmonary artery, left atrium or aorta, in the conditions like vascular rings, truncus arteriosus, total anomalous pulmonary venous connection, tetralogy of Fallot with absent pulmonary valve, etc. These can prolong ventilatory dependency of the patients Our aim was to use a holistic alternative approach to open collapsed lung in pediatric patients with congenital heart disease using simple and innovative lung recruitment technique.





**Methods:** From January 2020 to March 2021, four preoperative pediatric cardiac patients having collapsed left lung, due to compression of left main bronchus, undergoing corrective cardiac surgery were subjected to lung recruitment technique by using elective endobronchial intubation and suctioning with chest physiotherapy in the form of vibration and percussion along with intermittent ventilation with 100% oxygen.

**Results:** All four patients' collapsed lungs were opened up successfully post procedure, which was confirmed by immediate chest X rays and were successfully weaned off ventilator within 24–48 hours as per PICU protocol. One patient, who was extubated within 24 hours, had opposite lung collapse after extubation, which was managed with chest physiotherapy. Another patient had relative bradycardia (HR- 108/min) and desaturation (spo2-66%) during procedure, which was improved immediately after withdrawing tube and instituting two lung ventilations with 100% oxygen.

**Discussion:** Generally, flexible fiberoptic bronchoscope (FOB) is used in such type of scenario, but there are limitations of it, like non-availability of neonatal size, expertise in technique, premature and small infants, who require less than 3.5 mm size endotracheal tube, where negotiation of FOB from endotracheal tube (ETT) is not possible. This lung recruitment technique helps in improvement in lung mechanics and early weaning and shorten the duration of mechanical ventilation. It is relatively easier and safer technique one can use.

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PP:20

#### APROTININ INHIBITS THROMBIN GENERATION BY THE INTRINSIC PATHWAY OF COAGULATION, BUT IS NOT A DIRECT THROMBIN INHIBITOR

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**Introduction:** Aprotinin is a broad-acting serine protease inhibitor that has been clinically used to prevent blood loss during major surgical procedures including cardiac surgery and liver transplantation. The effect of aprotinin in reducing perioperative blood loss is generally assumed to be related to its antifibrinolytic effect. Aprotinin is a direct inhibitor of plasmin, but also inhibits FXIIa-

dependent activation of fibrinolysis by inhibiting kallikrein which activates factor XII in the contact pathway. By inhibition of kallikrein, aprotinin also inhibits activation of coagulation via the contact pathway. It has also been shown that aprotinin inhibits platelet activation, although reports in the literature have been conflicting with some reporting that aprotinin inhibits platelet activation by various agonists, whereas others report selective inhibition of platelet activation by thrombin (1-3). Anticoagulant effects of aprotinin, including inhibition of the TF-VIIa complex (4) and of thrombin (3) have been described as have procoagulant effects, notably inhibition of the anticoagulant activated protein C (5).

**Methods:** Here we assessed effects of aprotinin on various hemostatic pathways in vitro, and compared effects to tranexamic acid (TXA), which is an antifibrinolytic but not a serine protease inhibitor. We used plasma-based clot lysis assays, clotting assays in whole blood, plasma, and using purified proteins, and platelet activation assays to which aprotinin or TXA were added in pharmacological concentrations.

**Results:** Aprotinin and TXA dose-dependently inhibited fibrinolysis in plasma. Aprotinin inhibited clot formation and thrombin generation initiated via the intrinsic pathway, but had no effect on reactions initiated by tissue factor or FXIa. However, in the presence of thrombomodulin, which is an activator of the protein C pathway, aprotinin enhanced thrombin generation in reactions started by tissue factor or FXIa. This procoagulant effect of aprotinin relates to its inhibitory activity towards activated protein C. TXA had no effect on coagulation. Aprotinin did not inhibit thrombin, only weakly inhibited the TF-VIIa complex and had no effect on platelet activation and aggregation by various agonists including thrombin. Aprotinin and TXA inhibited plasmin-induced platelet activation.

**Discussion:** Pharmacologically relevant concentrations of aprotinin inhibit coagulation initiated via the intrinsic pathway, which is in line with the observation that aprotinin decreases markers of coagulation activation in vivo (6-7). The antifibrinolytic activity of aprotinin likely explains the prohemostatic effects of aprotinin during surgical procedures. The anticoagulant properties may be beneficial during surgical procedures in which pathological activation of the intrinsic pathway, for example by extracorporeal circuits, occurs. Aprotinin is not a direct thrombin inhibitor or an inhibitor of platelet activation. The clinically reported preservation of platelet count and function by aprotinin (8-9) is likely explained by inhibition of plasmin-induced platelet activation and inhibition of platelet activation by thrombin generated via the intrinsic pathway of coagulation.

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**PP:21****PREOPERATIVE ANAEMIA AND BLOOD TRANSFUSION IN CARDIO-THORACIC SURGERY: A SINGLE CENTRE RETROSPECTIVE AUDIT**

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**Introduction:** Preoperative anaemia is a major risk factor for peri-operative blood transfusion, which is associated with post-operative morbidity and mortality. World Health Organisation (WHO) states that every effort should be made to optimise surgical patient's own blood volume using a patient blood management (PBM) approach as it has been shown to improve outcomes and reduce healthcare costs in a number of studies. So, this study was aimed to identify the prevalence of preoperative anaemia, evaluate the preoperative intervention program and peri-operative transfusion rates among patients undergoing cardio-thoracic surgery

**Methods:** We collected data retrospectively over a period of one month from patients who underwent cardiac and thoracic surgery in a university teaching hospital. Anaemia was defined as haemoglobin concentration below 130g/l for men and 120g/l in female.

**Results:** A total of 120 (67-Cardiac surgery,53-Thoracic surgery) adult patients undergoing cardio-thoracic surgery were included in the study. Majority of the patients (55% of cardiac surgery and 60% of thoracic surgery patients) belonged to 60-80 Age group. Pre-operative anaemia was present in 31% of cardiac patients and 35% of thoracic patients. None of the patients in the cardiac group was referred to anaemia clinic or received any iron supplements or pre-op blood transfusion. One patient in the thoracic group was referred to anaemia clinic and received IV iron.

In the cardiac group, 57% of anaemic patients received blood transfusion intra-operatively and 28% postoperatively whereas only 9% of non-anaemic patients received blood transfusion intra-operatively and 2% post operatively.

In the thoracic group, 10% of anaemic patients received blood transfusion intra-op and non-post op. In the non anaemic group, none received blood transfusion. Haematinics were prescribed post operatively for 60% patients in the cardiac group.

**Discussion:** Preoperative anaemia was present nearly one-third of patients (31% cardiac surgery and 35% thoracic surgery) at our centre. However, blood transfusion requirements were significantly high among cardiac surgery patients compared to thoracic surgery patients. Referral and anaemia treatment were infrequently initiated in preoperative anaemic patients. Following the audit, significant changes have been made regarding anaemia referral and optimisation of anaemia preoperatively. Repeat audit is planned in six months time to review the change in practice.

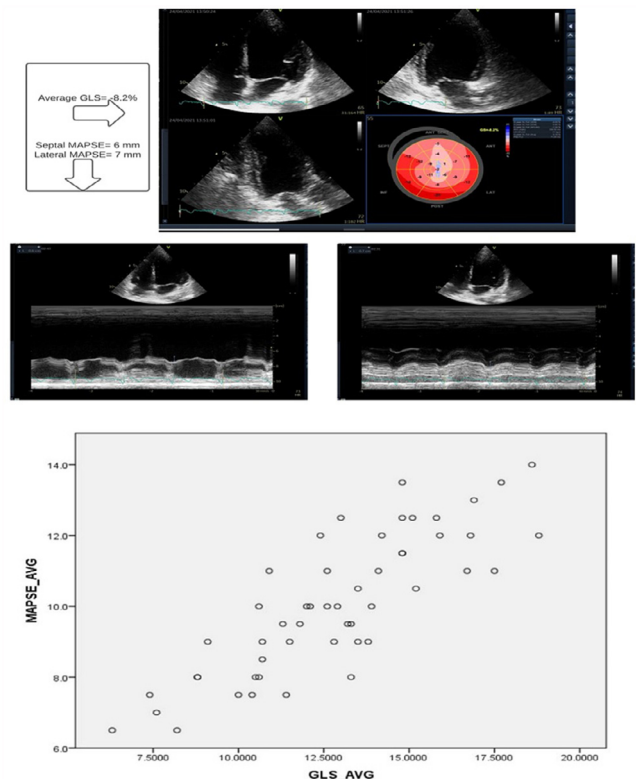
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**PP:22****INTERPRETATION OF PLATELET MAPPING: IS IT GRAPH IMPORTANT**

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**Introduction:** Platelet mapping has become a standard for patients on dual anti platelet medication coming for cardiac surgery. Platelet mapping has also been used to predict increased bleeding in patients on anti-platelet medication for major abdominal surgeries. Interpretation of platelet mapping is paramount in these cases.



**Methods:** Case report

A 70-year-old male with history of hypertension and ischaemic heart disease was posted for urgent major abdominal surgery. He was on Clopidogrel and prophylactic dalteparin. A platelet mapping was done by TEG 6, to assess the percentage of platelet inhibition

The platelet mapping showed 100% inhibition for ADP and 100% inhibition for AA. Platelets were requested for the procedures. Re analysing the platelet mapping graph, we could identify the misinterpretation of the study. The HKH trace was abnormal with prolonged R time and reduced MA, may be due to the dalteparin. So that made the interpretation of the result abnormal. The patients didn't receive any products at the end of the procedure.

**Discussion:** The use of viscoelastic haemostatic tests (VETs) to guide resuscitation during major haemorrhage has increased significantly in recent years and is now recommended by the National Institute for Health and Care Excellence (NICE) for cardiac surgery. TEG PlateletMapping assay percentage (%) inhibition/ aggregation calculation. The platelet inhibition in response to the agonist is calculated from platelet aggregation:  $[(MA\ ADP - MA\ Fibrin) / (MA\ Thrombin - MA\ Fibrin) \times 100]$  and % inhibition =  $(100\% - \% \text{ aggregation})$ .

A reduction in the baseline value in the HKH trace, due to reduced fibrinogen or prolonged R time, alter the equation and hence the platelet aggregation and inhibition.

In our case, the R time was prolonged and the MA fibrin was reduced. This can be attributed to the dalteparin effect. The value of 100% inhibition of ADP and AA may lead to misinterpretations, if the graph is not properly analysed. If HKH trace is abnormal results should be interpreted with caution and an alternative platelet function test is advisable for management of anti-platelet activity

**Discussion:** Conclusion: Platelet mapping by thromboelastograph method is very useful tool in patients on anti-platelet medication. HKH trace is important in thromboelastographic platelet mapping. An abnormal HKH trace results be interpreted with caution and an alternative platelet function test is advisable.

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**PP:23****COMBINED TREATMENT WITH IGM ENRICHED IMMUNOGLOBULIN AND CYTOSORB IN INFECTIVE ENDOCARDITIS: CASE SERIES**

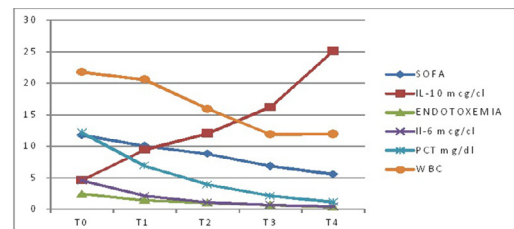
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**Introduction:** Infective endocarditis is a serious disease condition. Depending on the causative microorganism and clinical symptoms, cardiac surgery and valve replacement may be needed, posing additional risks to patients who may simultaneously suffer from septic shock. The combination of surgery bacterial spreadout and artificial cardiopulmonary bypass (CPB) surfaces results in a release of key inflammatory mediators leading to an overshooting systemic hyperinflammatory state frequently associated with compromised hemodynamic and organ function.(1) Combined use of hemoadsorption (2)and IgM enriched Immunoglobulin (3) might represent a potential approach to control the hyperinflammatory systemic reaction associated with the procedure itself and subsequent clinical conditions by reducing a broad range of immunoregulatory mediators and endotoxemia.



**Methods:** We describe retrospectively 8 cardiac surgery patients with proven acute infective endocarditis obtaining valve replacement with CPB surgery in combination with intra e postoperative CytoSorb hemoadsorption and intravenous administration of IgM enriched Immunoglobulin (Pentaglobin<sup>®</sup>) 250 mg/kg die. for three consecutive days

**Results:** Combined treatment of hemoadsorption and IgM enriched Immunoglobulin was associated with a mitigated postoperative response of key cytokines (4) with a significant reduction of IL-6 and Endotoxemia (5) an increase of IL10 (6); an improvement of clinical metabolic parameters (WBC and SOFA score). Moreover, patients showed hemodynamic stability which possibly could be attributed to the additional combined treatment. Intraoperative hemoperfusion and Pentaglobin administration were well tolerated and safe without the occurrence of any related adverse event.

**Discussion:** Conclusion: This approach may open up potentially promising therapeutic options for infective endocarditis, with pro and anti-inflammatory modulation, improved hemodynamic stability and organ function as seen in our experience.

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## PP:24

### OUTCOMES RELATED TO VENOUS TO ARTERIAL CARBON DIOXIDE GAP AND PERFUSION PARAMETERS IN PATIENTS UNDERGOING VENO-ARTERIAL EXTRACORPOREAL MEMBRANE OXYGENATION

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**Introduction:** Patients placed on Veno-Arterial Extracorporeal Membrane Oxygenation (VA-ECMO), represent a complex clinical setting where optimal tissue perfusion is critical (1-2). Elevated venous to arterial carbon dioxide gap and blood gas surrogate calculations have been associated with higher mortality in septic and cardiogenic shock patients (3). We theorized that perfusion parameters derived from arterial and venous/premembrane blood gases while on ECMO could be used as perfusion markers that can be associated with mortality (2).

**Methods:** A retrospective, observational study was performed between December 2018 and November 2019 in a single center university hospital. 28 VA-ECMO runs were included for analysis without age restriction. Arterial, venous and premembrane samples were obtained per institutional protocol and paired with vital signs and common perfusion parameters such as, cerebral near infrared spectroscopy readings (NIRS), venous saturation (SvO<sub>2</sub>), and arterial lactate. Given that there is no equivalent to a mixed venous blood sample, while on VA-ECMO, both a central line blood sample (tip usually located in the cavo-atrial junction or the right atrium) and a premembrane-line blood sample were used for calculations and analysis (1); these samples were compared in order to assess potential differences. Univariate, bivariate analysis and linear regressions were performed, considering a p < 0,05 as statistically significant. All data was gathered after the observation period was concluded, and with previous ethical committee approval

**Results:** Eleven patients died, nine while on therapy and two after weaning and decannulation. One patient died before blood samples could have been obtained. There was no difference between survivors and non-survivors when CO<sub>2</sub> gap or SvO<sub>2</sub> were analyzed paired at the first arterial venous/premembrane blood gases. Lower cerebral NIRS values and higher lactate concentrations were observed in the non-survivor group compared to the survivor group at the first paired measurement within the first 24 hours of ECMO support.

	Survivor (n=17)		Non-Survivor (n=10)		p-value
	IC95%	IC95%	IC95%	IC95%	
Age (years)	17,3	( 5,6 - 29,0 )	32,3	( 16,3 - 48,2 )	0,107
Days on ECMO	4,5	( 3,8 - 5,7 )	6,6	( 2,7 - 10,4 )	0,204
First 24 hours of ECMO Support					
CO <sub>2</sub> Gap (mmHg)					
Arterial to Venous	8,9	( 5,8 - 12,0 )	9,2	( 4,0 - 14,5 )	0,901
Arterial to Premembrane	6,4	( 3,8 - 9,0 )	4,4	( 2,2 - 6,7 )	0,276
CO <sub>2</sub> Gap / Oxygen Content Difference (Ratio)					
Arterial to Venous	1,8	( 1,2 - 2,3 )	2,7	( 0,2 - 5,2 )	0,283
Arterial to Premembrane	1,6	( 1,0 - 2,3 )	2,0	( 0,2 - 3,8 )	0,625
Cerebral NIRS (%)	65,5	( 60,4 - 70,5 )	47,0	( 32,1 - 61,9 )	0,003
Arterial Lactate (mmol/L)	1,9	( 1,6 - 2,2 )	4,3	( 2,4 - 6,1 )	0,001
Venous Oxygen Saturation (%)	72,1	( 68,4 - 75,8 )	66,1	( 52,3 - 79,9 )	0,254

During V-A ECMO support the average iDO<sub>2</sub>/iVO<sub>2</sub> ratio was 4,2:1. Significant differences were observed between venous and premembrane pCO<sub>2</sub>, bicarbonate and saturation, the latter close to a 4% difference when evaluated from paired samples.

**Discussion:** No differences were observed amongst survivors and non-survivors when the first CO<sub>2</sub> Gap or other delivery/consumption parameters were analyzed. Even though we failed to find differences between the survivor groups, better evidence is needed to assess whether these can be useful in the critically ill patient on VA-ECMO (2,4). Arterial lactate and cerebral NIRS remain an important instrument of tissue perfusion monitoring that can be of use and impact outcomes such as mortality. There was a statistically relevant difference between venous and premembrane samples, the clinical relevancy of these findings should be evaluated by further studies that take into consideration cannulation configuration and left ventricular venting.

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## PP:25

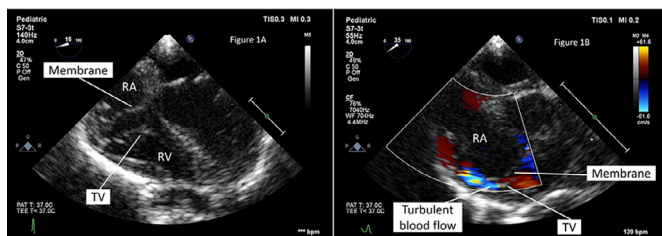
### INTRAOPERATIVE MANAGEMENT OF A NEWBORN WITH COR TRIATRIUM DEXTRUM: A CHALLENGING CASE

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**Introduction:** Cor triatrium dextrum is an extremely rare cardiac condition with an incidence of < 0.1% of all congenital heart defects (CHDs). It is caused by persistence of the right valve of the sinus venosus which separates right atrium (RA) into an inlet portion receiving systemic venous blood from the inferior and superior venae cavae, and an outlet portion containing the right atrial appendage and the orifice of the tricuspid valve (TV).<sup>1</sup>



**Methods:** CASE REPORT: Informed parental consent was obtained to present this case. A 20-day-old term infant weighing 2.8 kg was admitted for progressive cyanosis and difficulties to thrive. At physical examination the newborn had a peripheral oxygen saturation of 75%. Preoperative chest X-ray showed a clog-shaped heart. Preoperative NT pro-BNP was 2311 ng/L. Repeated transthoracic echocardiography confirmed the diagnosis of cor triatrium dextrum and a R-to-L shunt through a patent foramen ovale. Distal pulmonary arteries were small for age. Surgery was scheduled. At the induction of anesthesia specific attention was paid to maintain normovolemia and a blood pressure and heart rate as compared to baseline values. Induction of anesthesia was performed with 2 mg Ketamine, 0.2 mg midazolam and 2 µg sufentanil. Tracheal intubation was facilitated with cisatracurium. Anesthesia was maintained with 1% Sevoflurane and a continuous infusion of sufentanil. Intraoperative transesophageal echocardiography (TEE) confirmed the diagnosis. The TEE 4 chamber view showed a membrane within the RA (Figure 1A) with a spinnaker movement in diastole when it was bulging into the TV (Figure 2). Laterally, there was an opening within the membrane permitting turbulent blood flow from the RA through the TV (Figure 1B). Resection of the membrane was uneventful and the foramen ovale was closed. Weaning from cardiopulmonary bypass (CPB) was facilitated with a continuous infusion of milrinone.

**Results:** Figures 1A and 1B: Intraoperative TEE view of the membrane.

**Discussion:** Cor triatrium dextrum being an extremely rare CHD, anesthesiologists may not be familiar with its clinical presentations. Depending on the degree of the RA obstruction, poor right ventricle (RV) filling and compromised pulmonary blood flow may occur. Neonatal cyanosis may appear due to streaming of the blood from the RA across the atrial septum to the left atrium. Intraoperative actions need to be taken in order to increase RV filling. In this case the opening from the RA to the RV resulted in turbulent flow but intraoperative hemodynamic

optimization increased this forward flow and prevented any oxygen saturation concentrations < 75% before starting CPB.

**LEARNING POINTS:** 1. Anesthesiologists need to be aware of intraoperative hemodynamic instability and cyanosis due to the obstructive membrane within RA in case of cor triatrium dextrum.

2. Pre CPB TEE should carefully evaluate the TV that may mimic an Ebstein anomaly as the membrane may bulge into the TV.

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**PP:26**

## PATIENT PERIOPERATIVE EXPERIENCE AT ST. BARTHOLOMEW'S DURING THE COVID-19 PANDEMIC

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**Introduction:** The pressure of the global COVID-19 pandemic led to unprecedented changes in the delivery of health-care services in a short period of time. Due to the nature of cardiothoracic surgery, there was an urgent need to adapt and continue delivery of services whilst maintaining patient and staff safety (1) St. Bartholomew's Hospital is a Cardiothoracic tertiary centre. The trust underwent mass redistribution of intensive care services and creation of a new hospital (The Nightingale) to manage the influx of COVID-19 patients. Therefore, the delivery of cardiothoracic perioperative services changed significantly, requiring online or telephone appointments for pre-op assessment clinic; strict no visitors policy and the need for patient self-isolation prior to hospital admission. Delivering perioperative care in this new environment was challenging and we wanted to investigate how these changes impacted the perioperative experiences of cardiothoracic patients during this time with the aim of improving any shortcomings identified.

**Methods:** Between 7-8th September 2020, all patients who were at least 48h post-procedure were given a self-administered paper questionnaire after verbal consent was obtained. This consisted of a total of eight structured and unstructured questions. These were analysed using simple frequency analysis and manual analysis respectively. Common themes were identified.

**Results:** 51 patients completed the questionnaire - 39 cardiac and 12 thoracic patients. The main themes were pain and surviving the operation with concerns regarding family. 88% of patients positively recalled speaking to an anaesthetist face to



face, with over half of these interactions being a day before their surgery. 92% felt meeting the anaesthetist was useful in addressing their worries and helped with anxiety. Information delivery regarding post-operative pain was an overwhelming theme and potential area for improvement. 88% of patients would recommend St. Bartholomew's hospital to friends and family. 64.8% who completed the question "Is there anything else you want to tell your anaesthetists or critical care doctors?" wanted to express their gratitude to all healthcare professionals involved in their care. Interestingly, a number of patients reported that they would like information about lifestyle changes and identified a potential window for signposting for more support.

**Discussion:** Unfortunately, there is little national or international data for direct comparison of our findings. Post-operative pain expectations can be further explored to establish whether more pre-operative information surrounding analgesia is required. Anaesthetists should be aware that the perioperative period for major surgery is a teachable moment for potential lifestyle changes and could play an important part in utilising this opportunity. We hope that this simple questionnaire can provide healthcare staff a better insight into perioperative patient experience and the importance of preoperative provision of information. Despite significant changes during the pandemic, it is reassuring to know that the overall patient experience was positive.

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PP:27

### EARLY POSTOPERATIVE SERUM OSMOLARITY IMBALANCE MAY PREDICT WORSE SHORT-TERM MORTALITY AFTER HEART TRANSPLANTATION IN ADULTS

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**Introduction:** Perioperative homeostatic balance is one of the most important factors to determine the early morbidity and mortality after adults' heart transplantation. Medical management of end-stage heart failure, intra- and postoperative fluid therapy, preexisting renal and endocrine failure or dysfunction could have a heavy effect on these parameters. The ion balance

and osmotic regulation were in our focus in the current study to investigate the relationship to worse outcomes after cardiac transplantation.

**Methods:** A retrospective analysis was performed on heart transplant patients between February 2018 and April 2021. Perioperative laboratory tests, anthropometric data and past medical history were collected. Calculated serum osmolality was collected from arterial blood gas samples. Ratios to the baseline osmolality were calculated on postoperative days (POD) 1, 2, 3, 7, and 14. The significant difference in osmolality ratios was determined as a higher or equal deviation than 5 percent. The primary outcome was 90 days mortality. For descriptive statistics the Mann-Whitney U test and chi-square test were used. To investigate the relationship between collected parameters and primary outcome Cox regression method was used.

**Results:** During the examined period data from 142 patients were analyzed, 69.7% of them were male. The median of patients' age was 54 years (IQR: 45-60 years). The median follow-up time was 577.5 days (IQR: 242.25-795.0 days). During follow-up time 26 patients died (18.3%). Significant osmolality deviation was observed 27.5%, 26.5%, 22.6%, 34.1% and 33.3% of patients on the 1, 2, 3, 7, and 14 postoperative days, respectively. With descriptive statistics methods higher 90-days-mortality was observed in the deviation on days 2 cohort (6.0% vs. 19.4%, chi-square p=0.019) and deviation on day 3 cohort (6.8% vs. 20.0%, p=0.032).

Using Cox regression methods larger deviation than 5% of osmolality on postoperative day 2 and day 3 were associated with higher risk for overall mortality (dOsm $\geq$ 5% on POD2 HR: 3.443 95%CI: 1.157-10.248, p=0.018, dOsm $\geq$ 5% on POD3 HR: 3.110, 95%CI: 1.045-9.256, p=0.032).

**Discussion:** Deviation of osmolality larger than 5% to the baseline at the early postoperative period could be a risk factor/indicator of short-time mortality after heart transplantation in adults.

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PP:28

### ANAESTHESIA FOR THORACOSCOPIC THYMECTOMY IN MYASTHENIA GRAVIS: A NON-MUSCLE-RELAXANT TECHNIQUE

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**Introduction:** Anaesthesia for thymectomy is challenging due to the advance in surgical techniques (VATS), varied response of NMB agents, need for DLT and one lung ventilation, patients underlying myasthenia status and drug effects.

**Methods:** Case Report

A 60-year-old female with ocular-bulbar variant of MG, on increasing doses of prednisolone (100 mg every alternate day), with good symptom resolution on the day of steroid and mild symptoms the alternate days, was posted for VATS thymectomy. She developed steroid induced diabetes mellitus, gastritis, obesity and anaemia. Steroid was continued until the day of surgery.

Total Intravenous Anaesthesia (TIVA) with topical lidocaine and a non NMB technique was planned for induction of anaesthesia and insertion of Double lumen Endotracheal tube (DLT). Anaesthesia was induced with target site effect concentration of 4 - 6 micrograms/ml of Propofol (Schneider model) and 4-10 nanograms/ml of Remifentanyl (Minto model). Bispectral index monitoring applied before induction of Anaesthesia. Vocal cords were sprayed with 10% lignocaine. A left sided 37 French DLT was inserted and positioning was confirmed with fiberoptic bronchoscope. A good intubation condition for insertion of DLT was achieved without the use of NMB agents.

Shortly after commencement of OLV, patient desaturated, without any significant increase in airway pressures. DLT position was reconfirmed without the need for NMB agents. Due to surgical complexity and desaturation, decision was made to change from VATS to median sternotomy. The remaining procedure was completed through sternotomy and lung isolation done to facilitate the surgery. Patient received intercostal block and oxycodone for pain relief. The patient remained stable throughout the procedure and extubated at the end of the operation in theatre.

The patient monitored in intensive care unit for 48 hours. Patient made good recovery and was discharged home after four days.

**Results:** Recent advances and the strive for minimally invasive surgical techniques has led to Video Assisted Thoracoscopy (VATS) being used as an alternative to the original sternotomy approach. Placement of DLT and One lung ventilation is the usual method of achieving this. NMB agents can lead to unpredictable and prolonged paralysis in MG patients.

We demonstrated that good intubation conditions for DLT insertions can be achieved with appropriate use of TIVA and topical lidocaine spray to the vocal cords, without the use of NMB agents. It can also provide good operating condition for both VATS and open sternotomy. Dose of Remifentanyl was less than quoted in previous studies.

**Discussion:** Patients with MG will continue to present for thymectomy surgery and minimally invasive VATS will become more prevalent. TIVA with topical lidocaine spray to the cords

can provide good intubation conditions for DLT insertions and One lung ventilation without the use of NMB agents to facilitate these surgeries.

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**PP:29**

**THE ASSOCIATION BETWEEN PREOPERATIVE AND POSTOPERATIVE HEPATIC VENOUS FLOW AND THE OUTCOME AFTER CARDIAC SURGERY**

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**Introduction:** The hepatic venous flow reflects the pressure changes of the right ventricle. (1) Therefore, it starts to appear as a part of the echocardiographic examinations. Moreover, the back-and-forth link between the cardiovascular state and the liver is well-known for several years. (2,3) Our objective was to evaluate the association between preoperative and postoperative hepatic venous flow and the outcome of patients who underwent cardiac surgery.

**Methods:** Our prospective, observational study included 30 patients who underwent cardiac surgery between 2021 January and June at our Heart and Vascular Centre. Beside the routine echocardiographic examination, we also measured the venous blood flow in the common hepatic vein before the influx into the Inferior Vena Cava with Doppler ultrasound before and after the surgical procedure. We recorded the standard four waves' (V, D, S, A) maximal speed and velocity time integral (VTI). In our database we recorded the patients' demographic data, preoperative and postoperative hemodynamic and hepatobiliary markers and the EuroSCORE. We collected the length of stay (LOS), the intensive care unit stay, the vasopressor and inotrope need, and the occurrence of acute kidney injury (AKI). Our primary outcome was AKI, it was defined by the Kidney Disease Improving Global Outcomes (KDIGO) guidelines, which is one of the first signs of circulation problems. We used the SPSS 22 program to analyse our data, with descriptive parameters and Cox-regression analyses.

**Results:** Median age was 67.9 (IQR 25-75: 60.6-73.6), none of them had any liver or renal disease in their medical history. Most common surgical procedure was AVR (atrial valve repair) (40%). During the first postoperative week 6 patients developed AKI. Between the AKI and non-AKI subgroups with Inverse Probability Weighting we found a significant difference at the postoperative A and D waves' VTI, ( $p=0,031$  and  $0,022$ ) and the preoperative retrograde/antegrade waves' VTI ratio after adjustment for age, Euroscore, diabetes and GFR. ( $p=0,001$ ). With paired-samples T test the V waves' VTI's difference was significant between the preoperative and postoperative measurement.

**Discussion:** The increment in the hepatic venous retrograde waves, which are related to hepatic stasis, can predict worse outcomes among cardiac patients. Therefore, we might include this potentially useful tool in routine echocardiographic examinations and monitoring through the whole hospital stay.

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**PP:30**

### AORTIC STENOSIS IN A COMPLEX CASE OF MAJOR VASCULAR SURGERY

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**Introduction:** Aortic stenosis (AS) in non-cardiac surgery increases perioperative risk of complications (1)

**Methods:** Case report of single patient

**Results:** A 70-year-old lady with complicated type 2 diabetes with renal, retinal and coronary affection is admitted to a district

general hospital (DGH) with a decompensated heart failure. She is known to have hypertension, restrictive pneumopathy due to obesity (Body Mass Index of 49), stable angor with 2 stents in circumflex and right coronary artery, a moderate AS with moderately impaired Left ventricular function, and an untreated umbilical hernia. On admission microcitic anaemia was diagnosed with hemoglobin of 7.4 g/dl thought to be due to NSAID administration. After red blood cell (RBC) transfusion and deplective treatment was instituted, her dyspnea improved. Nevertheless, after 10 days of hospital admission she started with fever and positive blood cultures for *Enterococcus faecium* and *Staphylococcus aureus* Methicillin-resistant (MRSA). No vegetation was found in transthoracic and transoesophageal echocardiography, CT brain was normal but in the CT of the abdomen a infrarenal pseudoaneurysm of the Aorta was evidenced. She was transferred to our centre for treatment of the mycotic pseudoaneurysm. Upon arrival to a PET-scan confirmed the active infective focus in the infra-renal Aorta. She was started on daptomicin+ ceftaroline. Due to high risk of opened surgery an endovascular exclusion of pseudoaneurysm was proposed to prevent aortic rupture. Discussion with heart team took place and aortic balloon valvuloplasty was deemed too risky due to infection scenario and moderate grade of AS. Preoperative optimisation was performed increasing furosemide due to congestive lung signs in chest X-ray.

Upon her arrival at interventional radiology suite, she was monitored invasively with left radial artery blood pressure and central venous pressure via right internal jugular vein. Intraoperative approach was based on conscious sedation with remifentanyl and local anaesthesia. Nevertheless, equipment for converting to a general anaesthesia was prepared and a second consultant anaesthetist kept available to give assistance to this remote area in case of emergency. During the procedure she maintained tendency to hypertension with mean arterial pressure of 100-110 mmHg and central venous pressure of 22 mmHg. Total diuresis was 100 ml. Blood gas analysis revealed Hb of 8.5 g/dl, pO<sub>2</sub> of 120 mmHg with 35% of facemask oxygen and pCO<sub>2</sub> of 38 mmHg. 1 unit of RBC was transfused. The pseudoaneurysm was excluded with no residual leak. Postoperatively, she was admitted to a surgical intensive care unit where she stayed for 20 hours. After 12 days of uncomplicated hospital admission, she was discharged to original DGH hospital.

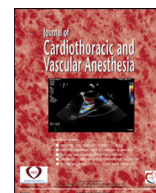
**Discussion:** Aortic stenosis in vascular surgery modify perioperative approach including intraoperative monitoring, type of anaesthesia and postoperative ICU admission. Preoperative optimisation and multidisciplinary assessment via Heart team of Aortic valvuloplasty is recommended. We report a high risk patient with heart failure and moderate AS that underwent an uneventful endovascular exclusion of mycotic pseudoaneurysm under conscious sedation and local anaesthesia.

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## AUTHOR INDEX

- Abdelaatti, A., PP:06  
 Adamson, M., PP:05  
 Adelmeijer, J., PP:20  
 Al Tmimi, L., PP:04  
 Alaboud, S., CO:15  
 Alexandrova, O., PP:16, PP:18  
 Alfadhel, A., CO:01, CO:06  
 Almeida, C., CO:02  
 Alshahrani, M., CO:15  
 Alston, P., CO:09, CO:22, PP:15  
 André, E., PP:25  
 Asegaonkar, B., CO:08  
 Aza, N., CO:22
- Bagdasarov, P., CO:04  
 Bains, R., PP:28  
 Balog, Á., CO:16  
 Barbier, M., PP:25  
 Barnwell, N., PP:06  
 Barros Campo, J.A., PP:01  
 Beltran-Rios, A., CO:20  
 Beltran, A., PP:08  
 Bertini, P., CO:17, PP:23  
 Beurton, A., CO:21  
 Bodrov, D., PP:16, PP:18  
 Body, S., PP:26  
 Boer, C., CO:11  
 Boissier, E., CO:21  
 Bokhari, A., CO:15  
 Borde, D., CO:08  
 Bouchez, S., PP:10  
 Brizzi, G., CO:17  
 Brom, C.V.D., CO:11  
 Brovman, E., CO:01  
 Bruguera, C., CO:01  
 Butnar, A.C., PP:09
- Carbonez, K., PP:25  
 Celiento, M., CO:17  
 Cepeda Pinzón, L.F., PP:01  
 Chamorro Falero, C., CO:19  
 Cholley, B., CO:21  
 Cobey, F., CO:01, CO:06  
 Colli, A., CO:17  
 Cornejo, M.B., CO:19  
 Cotter, G., PP:07  
 Crosbie, H., CO:22
- Dénes, A., PP:29  
 De Andrés Ibáñez, J., PP:13  
 De Beco, G., PP:25  
 De Wijs, C., CO:23  
 Degryse, C., CO:21  
 Dekker, N., CO:11
- Denes, A., PP:27  
 Denizou, M., CO:13  
 Dhanndhiganaahalli, S., PP:21  
 Di Bari, N., PP:14  
 Dossow, V.V., CO:05
- Eke, C., PP:27, PP:29  
 Erdős, G., CO:10  
 Evans, C., PP:05
- Falcetta, G., CO:17  
 Fallatah, S., CO:15  
 Fernandes, M., CO:02  
 Ferrufino, R., CO:01  
 Fiore, M., CO:21  
 Franchi, F., PP:23  
 Franco-Gruntorad, G., CO:20  
 Franco-Gruntorad, G.A., PP:24  
 Franco, G., PP:08  
 Fresiello, L., PP:04
- Gál, J., CO:16  
 Gambino, G., PP:03  
 García Araque, H.F., PP:01  
 Gaussem, P., CO:21  
 Gebhardt, B., CO:06  
 Gerber, D., CO:10  
 Ghamdi, T.A., CO:15  
 Gil Alvarova, Óñez-Milà, M., PP:30  
 Giraldo-Restrepo, M.P., PP:24  
 Glass, A., CO:14  
 Godier, A., CO:21  
 Gonzalez-Ciccarelli, L., CO:01  
 Gonzalez-Ciccarelli, L., CO:06  
 Govindaswamy, A., PP:17, PP:21, PP:28  
 Granell Gil, M., PP:13  
 Greco, F., PP:14  
 Guarracino, F., CO:17, PP:23
- Hamilton, E., PP:05  
 Harms, F., CO:23  
 He, Y., PP:02  
 Hordijk, P., CO:11  
 Horst, M.T., CO:23  
 Howland-Jackson, B., CO:22  
 Huskens, D., PP:20
- Ibañez, C., PP:30  
 Isildak, F.U., CO:03
- Jacobs, S.R., PP:10  
 Jarrott, R., CO:22  
 Jeeji, R., PP:22
- Jouan, J., CO:13
- Karattuparambil, J., PP:17, PP:21, PP:22, PP:28  
 Kasim, T., CO:04  
 Kawabori, M., CO:06  
 Kazakova, S., CO:04  
 Kazantsev, K., PP:16, PP:18  
 Keane, C., PP:07  
 Kelpis, T., PP:09  
 Keremidis, I., PP:09  
 Khalikova, E., CO:04  
 Khalil, M., CO:15  
 Khidr, A., CO:15  
 Kileen, T., CO:22  
 Kirillov, A., CO:04  
 Kler, P., PP:17  
 Komarov, R., CO:04  
 Korfiotis, D., PP:03  
 Kummerow, M., CO:05  
 Kunst, G., CO:07
- Lafferty, B., CO:14  
 Lambrecht, S., PP:04  
 Lapage, K., PP:10  
 Lecomte, P., PP:10  
 Lendrum, R., CO:14  
 Leonard, S., PP:03  
 Ligtenberg, M., CO:23  
 Lin, H., PP:02, PP:11, PP:12  
 Lisman, T., PP:20  
 Lolakos, K., PP:09
- MacHale, J., PP:06  
 Mandel, I., CO:04  
 Mansour, A., CO:21  
 Mantilla-Gutierrez, H., CO:20  
 Mantilla, H., PP:08  
 Marczin, N., CO:05  
 Marsaud, J.P., CO:13  
 Martinez, B., CO:05  
 Masoudi, J., CO:15  
 Mateo Rodríguez, E.M., PP:13  
 Matheswaran, P., PP:21  
 Matute, P., PP:30  
 McCall, P., CO:14  
 Meijers, J., PP:20  
 Melchionda, M., PP:14  
 Merkely, B., CO:16  
 Mestres, G., PP:30  
 Mik, E., CO:23  
 Milne, B., CO:07  
 Mohammed, A., PP:06  
 Moliner Velázquez, S., PP:13  
 Momeni, M., PP:25

- Montoya-Beltran, J.S., PP:24  
 Moorthy, A., PP:06  
 Morales Domene, J.J., CO:19  
 Moser, J., CO:11
- Nagy, Á., CO:16  
 Nedelec-Gac, F., CO:21  
 Nessler, N., CO:21  
 Niessen, H., CO:11  
 Nikoloudakis, N., PP:09  
 Nogtev, P., CO:04
- O'connor, A., CO:22  
 Odeleye, A., PP:26  
 Orsel, I., CO:13  
 Ortoleva, J., CO:01, CO:06  
 Ou, R., CO:22  
 Ouattara, A., CO:21  
 Ozdemir, I., CO:12  
 Ozturk, T., CO:12
- Palau Martí, C., PP:13  
 Pankras, J., CO:11  
 Panov, A., CO:04  
 Parkanyi, B., PP:27  
 Pascual De La Fuente, F., PP:13  
 Pasero, D., CO:05  
 Pasupuleti, K., PP:22  
 Paternoster, G., CO:17, PP:23  
 Pihan, F., CO:13  
 Pitsis, A., PP:09  
 Podolskiy, Y., CO:04  
 Poelaert, J., PP:10  
 Poncelet, A., PP:25  
 Preston, C., CO:22
- Quintero Beltrán, O.A., PP:01  
 Quraishi, S., CO:01
- Raimondo, P., PP:14
- Ramachandran, V., PP:17  
 Ramirez-Herrera, L., CO:20  
 Ramirez, L., PP:08  
 Ramos Arroyo, I.M., CO:19  
 Resor, C., CO:01  
 Rex, S., PP:10  
 Rosales, R.F., CO:06  
 Rouxinol, A.L., CO:02  
 Rovira, I., PP:30  
 Rowbotham, E., CO:22  
 Rozec, B., CO:21
- Sachde, J., CO:18, PP:19  
 Sandor, A., PP:27  
 Santacruz, C.M., PP:24  
 Santana-Rodriguez, Y., CO:20  
 Santana, Y., PP:08  
 Sasidharan, P., CO:14  
 Savluk, O., CO:03  
 Schols, G., PP:10  
 Scolletta, S., PP:23  
 Semple, C., PP:15  
 Senarslan, D.A., CO:12  
 Shadowy, S.A., CO:15  
 Shelley, B., CO:14  
 Shinnors, S., PP:06  
 Shreedhar, J., CO:08  
 Silversides, J., CO:14  
 Singh, G., PP:19  
 Smith, J.A., CO:01  
 Soe-Paing, J., CO:22  
 Sorbello, M., CO:15  
 Svalov, A., PP:16, PP:18  
 Szécsi, B., CO:16  
 Székely, A., CO:16, PP:29  
 Szabó, A., PP:29  
 Szabo, A., PP:27  
 Szabo, D., PP:27  
 Szecsi, B., PP:27  
 Szekely, A., PP:27  
 Szentgroti, R., PP:27
- Tahan, M.E., CO:15  
 Tarasov, E., PP:16, PP:18  
 Thomasset, P., CO:13  
 Tifrea, A., CO:13  
 Tifrea, M., CO:13  
 Tiquet, B., CO:13  
 Toth, K., PP:27  
 Tsotsolis, N., PP:09  
 Tyulpin, A., PP:16, PP:18
- Ubbink, R., CO:23
- Van De Velde, M., PP:04  
 Van Der Wel, N., CO:11  
 Van Gerven, E., PP:04  
 Van Gompel, C., PP:10  
 Van Leeuwen, A., CO:11  
 Van Meurs, M., CO:11  
 Vandroux, D., CO:13  
 Vervloet, M., CO:11  
 Vonk, A., CO:11  
 Vyzhigina, M., CO:04
- Waal, E.D., CO:05  
 Wang, S., PP:26  
 Wilson, E., CO:09
- Xu, H., PP:02, PP:11, PP:12
- Yavorovskiy, A., CO:04  
 Yavuz, Y., CO:03  
 Yildirim, F.N., CO:12  
 Yogarajah, A., PP:26  
 Yugueros, X., PP:30
- Zakharov, E., PP:16, PP:18



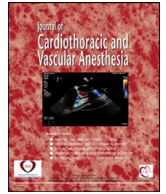


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