The
Academy NEWSLETTER

THE AMERICAN ACADEMY
OF
CARDIOVASCULAR PERFUSION
515A EAST MAIN STREET
ANNVILLE, PA 17003
(717) 867-1485 PHONE OR FAX
OFFICEAACP@AOL.COM
HTTP://WWW.THEAACP.COM

SUMMER 2017

Inside This Issue

Teamwork, Communication and Collaboration

What makes people successful? What makes teams succeed? What makes us feel good about the career choices we make? Am I happy about my job? Is it a just a job or truly an adventure? And the question I find most valuable and the one I ask myself most often, if I get the chance to sit it out or dance, did I dance? I often think about what works and what doesn't? We continue to hear terms like teamwork, collaboration and engagement. Many years ago when I was still in school my teachers reminded me that if I spoke to my classmates during an exam, it was cheating. Very shortly after graduation I learned that same conversation with classmates was now considered collaboration and was grounds for accolades and promotion. Collaboration is the action of working with someone to produce or create something. Similarly, Merriam-Webster describes teamwork as work done by several associates with each doing a part but all subordinating personal prominence to the efficiency of the whole.

I think most of us would agree that one of the keys to successful outcomes lies deeply rooted in effective teamwork. This concept is evident in many industries and areas in society. One striking example that comes to mind is the military's ability to repetitively and safely launch and land million dollar fighter jets on the deck of a ship bobbing up and down in the ocean. Additionally, many areas of healthcare including cardiothoracic surgery have noted similarities to the airline industry. Drawing on the airline industry concepts of human factor recognition and training, sterile cockpit models and crew resource management has led to positive changes in Healthcare. Assembling teams of individuals to work cohesively toward a common goal has become paramount to successful companies and institutions. However, is teamwork enough? How do we sustain top performance in our respected fields? Many would suggest that successful teams begin with engaged employees.

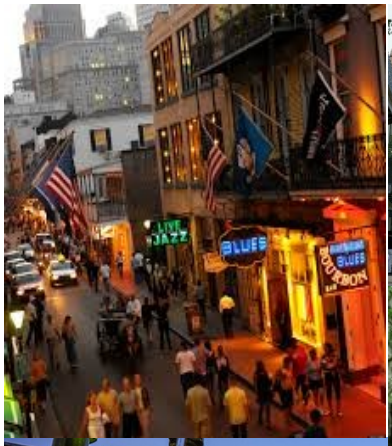
Employee engagement is a property of the relationship between an organization and its employees. An "engaged employee" is defined as one who is fully absorbed by and enthusiastic about their work and so takes positive action to further the organization's reputation and interests. Recently our institution has embarked on a plan to increase employee engagement by instilling a culture of respect for every individual that walks through the door including all employees, patients, families and vendors. The spread of our new "credo" has been transformational. I have witnessed teams from many disciplines working more closely and effectively at problem solving and providing the highest level of patient care and greater patient satisfaction than ever before. We have implemented tools such as daily tiered huddles, newsletters, electronic notification systems, streamlined organizational processes, and employee recognition awards. All of these supported by and quite frankly modeled by the highest level of leadership in our institution. One key aspect of this new found success seems to lie in a simple notion, communication. Communication that is clear, concise, confident, accurate, professional and in the operating room, "closed loop".

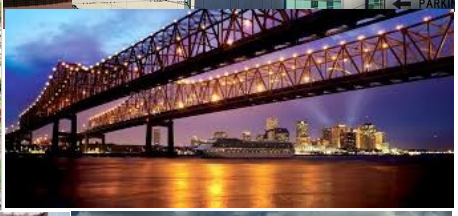
Continued on Page 2

Continued from Page 1

So, is this really a complex notion? Not at all, it's actually quite simple, just treat people the way you want to be treated and be accountable for your actions. One of my favorite books is "Reality-based leadership, ditch the drama, restore sanity to the workplace and turn excuses into results" Author, Sy Wakeman notes" the golden rule of teamwork is stop judging and start helping". I try to use her teachings by entering each situation asking myself, "how can I help and what can I do right now to add value? In closing, I urge each of you to become engaged professionals, collaborate with your peers, build strong teams and if you get the chance to sit it out or dance, I hope you dance.

James Beck, CCP
AACP President





New Orleans Area Attractions

http://www.neworleanscvb.com/visit/

ON BYPASS

REMEMBERING THE LINDBERGH PERFUSION PUMP

Kelly Hedlund, MS, CCP
Hayes, KS

and

Mike Sanford, CCP
Wheaton, KS

Charles Lindbergh had a knack for machinery. At the age of 9, he designed a wire-and-pulley system for moving large blocks of ice from his family's icehouse in Minnesota. Prior to becoming a teenager, he disassembled his father's Model T Ford to fix a timing trigger that had given out. And of course, his exploits in aviation demonstrated the ability of air-cooled engines to fly great distances. Little wonder, then, that in 1930 Lindbergh set out to tackle a most audacious problem - building a perfusion pump to keep tissue and organs alive outside the body. Lindbergh was a thinker, no doubt the result of his solitary time spent in the cockpit. Upon learning that his wife's older sister was dying of rheumatic fever, Lindbergh assumed that a simple fix was available. Likening it to a faulty valve in an engine, Lindbergh was soon puzzled to learn that nothing could be done for a diseased heart. Mitral commissurotomy procedures, first attempted in 1923, had largely been abandoned. Open-heart surgery wouldn't be perfected for decades.

Enter Alex Carrel …

Lindbergh had been famous since 1927, the year he piloted his *Spirit of St. Louis* airplane across the Atlantic. Carrel, on the other hand, had been studying vascular surgery since 1901 and had won the Nobel Prize in Physiology and Medicine in 1912. When the two men first met at the Rockefeller Institute in New York in November of 1930, each knew the other was a hero. Lindbergh's purpose in visiting Carrel was to propose his ideas about a mechanical heart to help his ailing sister-in-law. He even presented Carrel with a simple drawing of a crude artificial circulation system. Carrel was smitten with the pilot's enthusiasm, but shook his head in dismay. Pistons, necessary for an artificial pump to work, would surely damage the blood. Moreover, clotting and infection would occur. Though rejected, Lindbergh accepted Carrel's viewpoints as conventional wisdom and prepared to leave. In recent years, Carrel's focus had shifted to tissue and organ culture. In fact, for some time Carrel had been using a perfusion pump designed by one of his technicians, Heinz Rosenberger, to preserve whole organs. Unfortunately, the organs became contaminated with bacteria in every experiment. Carrel was keenly aware that Lindbergh understood machines like few people of his time. And so on a whim, before showing him to the door, Carrel asked Lindbergh if he wanted to see the perfusion pump. Lindbergh examined the device as if he had x-ray vision, and was astounded by its crudeness. In rather sly fashion, Carrel challenged Lindbergh to build a better perfusion pump. Lindbergh eagerly accepted, and promised to return in a couple weeks with a new design.

A Roman candle with twin glass spirals …

Lindbergh's initial sketches for a workable perfusion pump impressed Carrel (see Figure 1). So delighted, in fact, was Carrel with Lindbergh's innate sense of bioengineering that he invited him to join his laboratory. More designs from Lindbergh followed, and numerous prototypes were fashioned and discarded. Each version of Lindbergh's perfusion pump was painstak-

Continued on Page 4

Continued from Page 3

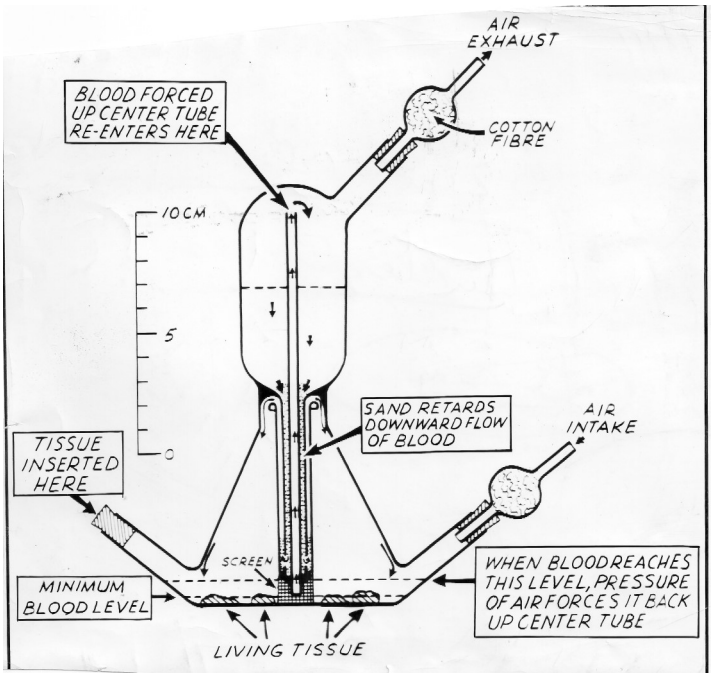


Figure 1 – Design sketch of an early Lindbergh perfusion pump (circa 1931). Note tissue samples at bottom of device.

ingly hand blown from Pyrex glass. Early versions resembled a Roman candle with twin glass spirals, or a double-headed glass goose. Time magazine referred to Lindbergh's device as a "… twist of vitrified bowel oozing out of a clear glass bottle". In the spring of 1935, Lindbergh announced that his latest design could perfuse whole organs, not just tissue (see Figure 2). Standing eighteen inches tall, the sterilized apparatus had three main chambers, as well as non-absorbent cotton balls at each entry port to filter germs. The perfusate medium, developed by Carrel, consisted of blood serum, amino acids, and insulin tinted with sterile red dye. An external gas supply of 40% oxygen, 4% carbon dioxide, and 56% nitrogen served to both oxygenate the perfusate and continuously propel it through the organ in a pulsatile manner (see Figure 3). Floating valves prevented backflow of the perfusate. The apparatus was housed in an incubator during use at a temperature of 37°C. Between 1935 and 1939, nearly 900 perfusion experiments were carried out using ovaries, spleens, kidneys, and adrenal glands from cats, dogs, and birds. Thyroid glands were amazingly well preserved for up to 30 days. Cat hearts would continue to beat for up to 12 hours. Lindbergh's device be-

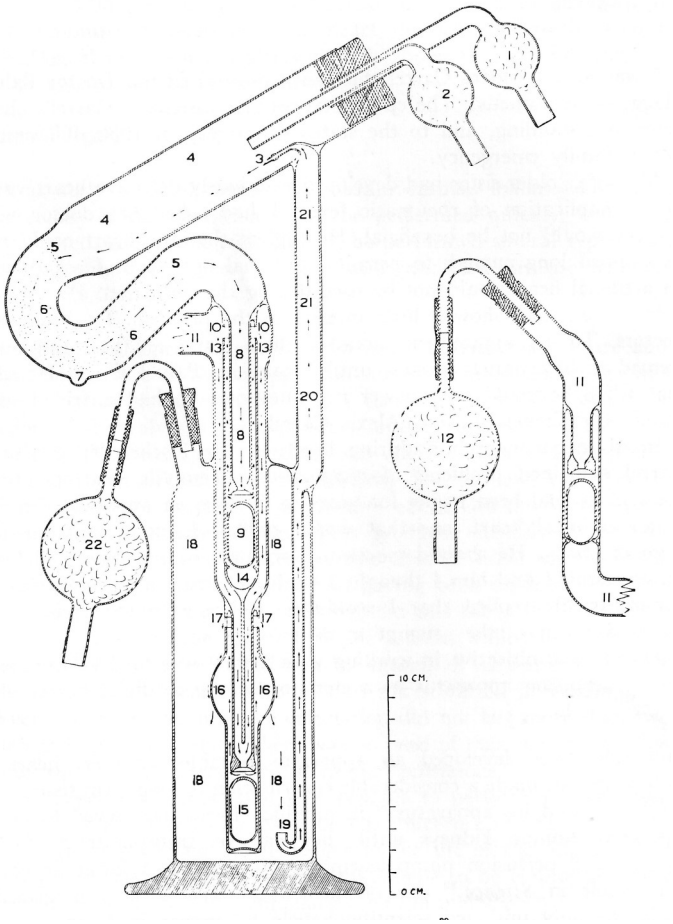


Figure 2 – Design sketch of Lindbergh's 1935 perfusion pump. Note upper-most chamber where tissue or whole organs would be placed.

came an object of wonder, having been exhibited before large crowds at the 1939 World's Fair in New York City. Lindbergh and Carrel were once again hailed as heroes, gracing the cover of Time magazine in 1938 (see Figure 4). Excitement raged, as laboratories across America and Europe ordered dozens of Lindbergh pumps. Most researchers, however, found the device impractical and difficult to use. By the early 1940s, the pump's time in the spotlight had run out. Carrel was forced into retirement by the Rockefeller Institute and returned to his native France. Lindbergh, a one-time conscientious objector to the United States' involvement in WWII, joined the fight and flew combat missions in the South Pacific.

A renewed interest …

During the 1960s, researchers at the Navy Medical Research Institute (NMRI) in Bethesda, Maryland

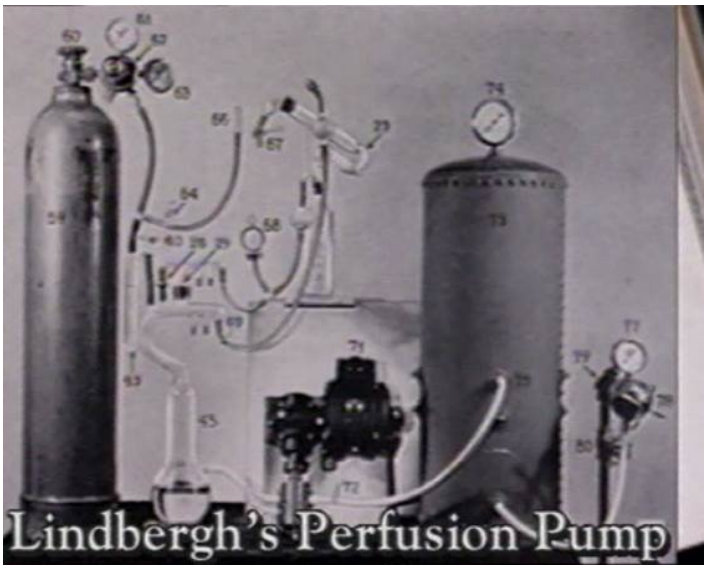


Figure 3 – External gas supply and pressure-regulating system attached to the Lindbergh perfusion pump (center of photo).

employed freeze-drying technology to study the preservation of whole organs. Lindbergh's perfusion pump, having sat dormant for over 20 years, was re-discovered and utilized by the NMRI Tissue Bank scientists. In fact, Lindbergh himself came out of retirement and was appointed as guest scientist to the project. The collaboration produced two publications, and reaffirmed Lindbergh's device as one of the world's greatest technological and medical marvels.

Figure 4 – 1938 issue of Time magazine.

References

Friedman DM. *The Immortalists: Charles Lindbergh, Dr. Alex Carrel, and Their Daring Quest to Live Forever*. HarperCollins Publishers. New York. 2007.

Dutkowski P, de Rougemont O, Clavien PA. *Alexis Carrel: Genius , Innovator and Ideologist*. Am Jour Transplantation. 2008;8:1998-2003.

Comroe Jr JH. *Who was Alexis Who?* Cardiovasc Diseases Bulletin of the Texas Heart Institute. 1979;6:251-270.

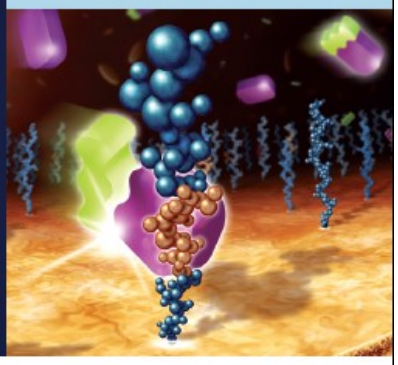
Bing RJ. *Lindbergh and the Biological Sciences: A Personal Reminiscence*. Texas Heart Institute Jour. 1987;14:231-237.

Carrel A, Lindbergh CA. *The Culture of Organs*. Paul B. Hoeber Inc. (Medical Book Department of Harper & Brothers Publishing). New York. 1938.

Lindbergh CA. *An Apparatus for the Culture of Whole Organs*. Jour Exp Med. 1935;62(3):409-431.

Lindbergh CA, Perry VP, Malinin TI, Mouer GH. *An Apparatus for the Pulsating Perfusion of Whole Organs*. Cryobiol. 1966:3(3):252-260.

PROTECT THE CIRCUIT, PROTECT THE PATIENT.[1,2,3,4]



Cortiva™
BioActive Surface

Cortiva's durable, non-leaching end point attached heparin surface enhances blood compatibility and thromboresistance.[1] Protect your patients with a product backed by the largest body of peer-reviewed clinical and scientific evidence of any CPB circuit biocompatible surface.

1. Kreisler KR, Vance RA , Cruzzavala J, Mahnken JD. Heparin-bonded cardiopulmonary bypass circuits reduce the rate of red blood cell transfusion during elective coronary artery bypass surgery. J Cardiothorac Vasc Anesth. 2005;19(5):608-611.
2. Olsson C, Siegbahn A, Henze A, et al. Heparin-coated cardiopulmonary bypass circuits reduce circulating complement factors and interleukin-6 in pediatric heart surgery. Scand Cardiovasc J. 2000;34(1):33-40.
3. Svenmarker S, Haggmark S, Jansson E, et al. Use of heparin-bonded circuits in cardiopulmonary bypass improves clinical outcome. Scand Cardiovasc J. 2002;36(4):241-246.
4. Heyer EJ, Lee KS, Manspeizer HE, et al. Heparin-bonded cardiopulmonary bypass circuits reduce cognitive dysfunction. J Cardiothorac Vasc Anesth. 2002;16(1):37-42.

For a listing of indications, contraindications, precautions and warnings, please refer to the Instructions for Use. CAUTION: Federal law (USA) restricts this device to sale by or on the order of a physician.

UC201710966 EN 04/2017

Medtronic
Further, Together

medtronic.com

The Student Section

Hypothermic Cerebral Perfusion: A Battlefield Against Neurologic Injuries In Patients On Cardiopulmonary Bypass

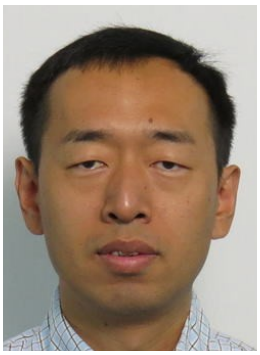
Weibin Liu

Cardiovascular Science Master Program,

Class of 2018

Midwestern University

Glendale, Arizona



Cardiac surgery, along with the development of cardiopulmonary bypass (CPB), significantly improve the capability of restoring patients' cardiac function and quality of life. Nevertheless, neurologic complications have been a source of concern since the inception of cardiac surgeries.[1] The incidence of major neurologic morbidity related to cardiac surgery falls between 1% and 6%, and up to 9% of selected patient populations may have shown clinical evidence of stroke.[1] In this student viewpoint essay, I will present a brief review of cerebral perfusion (CP) and perioperative risk factors, and various CP techniques. At the end, new paradigms of CP and hypothermia management are discussed.

Under resting physiologic conditions, 14% to 20 % of the cardiac output perfuses the brain tissue. Regulation of cerebral oxygen delivery (CDO_2) or cerebral blood flow is coupled with the cerebral metabolic rate of oxygen consumption ($CMRO_2$).[1, 2] In terms of perfusion pressure, the brain is a distinct organ. For most organ systems, perfusion pressure depends on the mean arterial pressure (MAP) versus central venous pressure gradient. In contrast, CP is dependent on the pressure gradient between MAP and intracranial pressure.[3]

With improved perioperative management and post-operative outcomes, the proportion of geriatric patients undergoing cardiac surgeries continues to grow.[4] Beyond the risk and physiologic stress factors on bypass, age-related pathophysiologic changes can exaggerate the incidence of neurologic complications post cardiac surgery and CPB procedures. Metabolic syndromes, including hypertension, hyperlipidemia, obesity, diabetes mellitus, and impaired glucose tolerance, are contributing factors for the development of cardiac surgical diseases and perioperative complications including neurologic injuries.[5] Previous stroke and abnormal serum albumin are identified as independent variables associated with delirium after cardiac surgery in elderly (≥ 60 years of age).[4]

With the goal to ensure adequate intraoperative systemic perfusion, CPB procedures impose non-physiologic stress to the whole body and bear risks to compromise CP. After initiation of CPB, acute hypothermia and rapid hemodilution potently disturb cerebral metabolism and oxygen delivery.[1] New balances between $CMRO_2$ and CDO_2 change dynamically on bypass. $CMRO_2$ is majorly determined by the tissue temperature in the brain, while CDO_2 is affected by hemoglobin concentration, pump flow and MAP.[1] Moreover, embolization, systemic inflammatory response, cerebral hyperthermia during the rewarming stage and extended ischemic time can contribute to neurologic damages. Furthermore, postoperative patient care, namely management of coagulopathy, control of hyperthermia, need for extracorporeal membrane oxygenation (ECMO) or assist device support, duration of hospital stay, etc., can have profound impact on neurologic outcomes.[1] Refinement in perioperative care, anesthetic management and surgical techniques over the past few decades have largely contributed to improved patient neurologic outcomes.[1]

Given the physiologic stress of cardiac surgery, CPB and incidence of neurologic injury, assessment of adequacy of CDO_2 remains a persistent point of care during CPB. Some cur-

Continued on Page 8

Continued from Page 7

rently-used techniques include near-infrared optical spectroscopy (NIRS), measurement of venous oxyhemoglobin saturation at the jugular bulb, transcranial Doppler and bispectral EEG analysis (BIS).[1]

During complex adult cardiac surgeries usually involving aortic arch, different techniques have been employed for optimal CP. Such techniques include deep hypothermic circulatory arrest (DHCA), antegrade CP (ACP) and retrograde CP (RCP). Hypothermia is the principal neuroprotectant for straight DHCA. Intermittent CP, selective ACP and RCP are used to reduce the chances or degrees of neurological injury. ACP is achieved by direct cannulation in the innominate, carotid or axillary arteries. ACP is usually conducted with a flow rate range at 10-20 ml/kg/min to maintain a perfusion pressure at 50-70 mmHg at the right radial artery.[2] During DHCA, RCP delivers oxygenated blood into the snared superior vena cava (SVC) at a flow rate of 150 to 700 ml/min. The mean RCP pressure of 25 mmHg, up to 40 mmHg, has been shown to be safe.[2]

There is still no consensus on the optimal CP methods despite multiple studies with varied degrees of clinical efficacy.[6] The retrospective findings of these studies, plus a patient population with greater surgical risk factors and preoperative neurologic morbidity rates, further complicates the comparison.[6] DHCA, with patient core temperature below 20°C, is a globally accepted technique with CPB for adult aortic arch repair. DHCA is generally recognized as safe for short procedures. Increased stroke and death rate has been associated with duration of DHCA greater than 45 minutes and 65 minutes respectively.[11]

In contrast to straight DHCA, both ACP and RCP allow continuous cerebral cooling, supply of oxygenated blood and washout of metabolites.[2] ACP allows independent control of blood temperature to the cerebral and systemic circulation with potential risk for embolization and extra cannula. The RCP approach is capable of flushing potential air emboli from cerebral circulation. RCP avoids additional manipulation of the arch vessels, therefore reducing procedure time and potential risk of dislodging atherosclerotic emboli. However, the retrograde cerebral perfusion flow limit remains unclear, complicated by significant extra-cranial collateral flows.

In addition to DHCA, promising results using ACP with “moderate” hypothermia (25°-28°C) have been reported.[7, 8, 13] Preventza O, et al. reported that aortic arch surgery patients of moderate hypothermia with ACP for >30 min had significantly improved long-term survival rate compared with the deep hyperthermia group.[13] Avoidance of deep hypothermia, prolonged perfusion time for warming and cooling is one of the major advantages of this strategy. Hypothermic circulatory arrest (HCA)/RCP and ACP provide comparable clinical outcomes with regard to mortality and stroke rates, but HCA with RCP resulted in a higher incidence of prolonged intensive care unit stay.[9] ACP might be preferred as the brain protection method for complicated aortic arch procedures.[10]

In a small scale survey published in 2010 of aortic arch surgeons at several academic medical centers in the United States (n=16), 50% stated they prefer selective ACP and 38% used some combination of ACP and RCP.[11] The international aortic arch surgery study group proposed new paradigms for adult aortic arch repair as “mild hypothermia without circulatory arrest,” further extending the gradual return to normal physiology in the conduct of aortic arch repairs.[12] Considering the nature of HCA and the diversity of clinical cases, algorithm-based individualized care plan of cerebral perfusion and circulatory arrest should be developed. Furthermore, improved understanding of CP under hypothermic conditions is required to embrace the practice of goal-directed perfusion targeting neurologic complications.

References

1. Gravlee GP, Davis RF, Hammon J, Kussman B. Cardiopulmonary Bypass and Mechanical Support: Principles and Practice. Fourth Edition. Wolters Kluwer. 2016. Ch. 15: 385-417.
2. Ghosh S, Falter F, Perrino AC. Cardiopulmonary Bypass. Second Edition. Cambridge Medicine. 2015. Ch. 12: 186-202.
3. Hill L, Gwinnutt C. Cerebral Blood Flow and Intracranial Pressure. http://www.frca.co.uk/Documents/170907%20Cerebral%20physiology%20I.pdf Retrieved on April 5th, 2017.
4. Castillo JG, Silvay G, Chikwe J. Cardiac anesthesia and surgery in geriatric patients: epidemiology, current surgical outcomes, and future directions. *HSR Proc Intensive Care Cardiovasc Anesth.* 2009;1(2):6-19.
5. Malik S, Wong ND, Franklin SS, et al. Impact of the metabolic syndrome on mortality from coronary heart disease, cardiovascular disease, and all causes in United States adults. *Circulation.* 2004;110:1245-1250.
6. Stoicea N, Bergese SD, Joseph N, et al. Pro: Antegrade/Retrograde Cerebral Perfusion Should Be Used During Major Aortic Surgery With Deep Hypothermic Circulatory Arrest. *J Cardiothorac Vasc Anesth*. 2016; 70(16):30418-30419.
7. Salazar J, Coleman R, Griffith S, et al. Brain preservation with selective cerebral perfusion for operations

requiring circulatory arrest: protection at 25 degrees C is similar to 18 degrees C with shorter operating times. *Eur J Cardiothorac Surg*. 2009;36(3):524-531.
8. Algarni KD, Yanagawa B, Rao V, et al. Profound hypothermia compared with moderate hypothermia in repair of acute type A aortic dissection. *J Thorac Cardiovasc Surg.* 2014;148:2888-2894.
9. Okita Y, Miyata H, Motomura N, et al. A study of brain protection during total arch replacement comparing antegrade cerebral perfusion versus hypothermic circulatory arrest, with or without retrograde cerebral perfusion: analysis based on the Japan Adult Cardiovascular Surgery Database. *J Thorac Cardiovasc Surg*. 2015;149(2):S65-S73.
10. Poon SS, Estrera A, Oo A, et al. Is moderate hypothermic circulatory arrest with selective antegrade cerebral perfusion superior to deep hypothermic circulatory arrest in elective aortic arch surgery? *Interact CardioVasc Thorac Surg*. 2016; 23(3): 462-468.
11. Stein LH, Elefteriades JA. Protecting the brain during aortic surgery: an enduring debate with unanswered questions. *J Cardiothoracic Vascular Anesthesia*. 2010; 24(2): 316-321.
12. Gutsche JT, Ghadimi K, Patel PA, et al. New frontiers in aortic therapy: focus on deep hypothermic circulatory arrest. *J Cardiothorac Vasc Anesth*. 2014; 28 (4):1159-1163.
13. Preventza O, Coselli JS, Akvan S, et al. The impact of temperature in aortic arch surgery patients receiving antegrade cerebral perfusion for>30 minutes: How relevant is it really? *J Thorac Cardiovasc Surg*. 2016 (16):31684-31691.

Contact Information for Our Sponsoring Partners

GETINGE GROUP
Phone: 888-627-8383
Fax: 732-667-1901
Website: www.maquet.com

INVOSURG
Fax: 617-507-6462
Website: www.invosurg.com

LIVANOVA
SORIN GROUP USA, INC.
Phone: 800-221-7943 or 303-467-6517
Fax: 303-467-6375
Website: www.soringroup.com

MEDTRONIC PERFUSION SYSTEMS
Phone: 763-391-9000
Websites: www.medtronic.com
www.perfusionsystems.com

QUEST MEDICAL, INC.
Phone: 800-627-0226 or 972-390-9800
Fax: 972-390-2881
Website: www.questmedical.com

TERUMO CARDIOVASCULAR SYSTEMS
Phone: 734-663-4145 or 800-521-2818
Fax: 734-663-7981
Website: terumo-cvs.com

The ACADEMY ANNUAL MEETING DEADLINES

ABSTRACT DEADLINE	**October 15, 2017**
MEMBERSHIP DEADLINE	**November 17, 2017**
PRE-REGISTRATION	**December 17, 2017**
HOTEL REGISTRATION	**December 17, 2017**
2018 ANNUAL MEETING	**January 17-20, 2018**

The MCH-1000(m)

The MCH-1000(i)
with optional Refrigeration
and Cardioplegia Modules

When Perfusionists Speak, We Listen.

The **CardioQuip MCH series** was born out of conversations with perfusionists. With features like our user-friendly interface, precise temperature controls, and easy cleaning methods, the MCH series delivers the accuracy and performance your patient needs and the simplicity you desire.

CardioQuip
Clean. Simple. Solutions.

Distributed by
invosurg

Invosurg Inc. is an exclusive CardioQuip distributor for CT, DE, FL, GA, KY, MA, MD, ME, NH, NJ, NY, NC, OH, PA, RI, SC, TN, VT, WV, and District of Columbia. Contact Invosurg at **617-699-7043** or **info@invosurg.com** for information on pricing and availability.

The Student Section

Heart Transplant for a Jehovah's Witness Patient : Case Report 4/6/17

Christopher Malatesta and **Richard Chan, CCP**

NSUH-LIUP School of Cardiovascular Perfusion

Great Neck, NY

Set Up

Following is the system used for the procedure: LivaNova Sorin Group S5 heart lung machine, Capiox Terumo FX25 hard shell reservoir with an integrated arterial filter hollow fiber membrane oxygenator, Sorin Revolution centrifugal blood pump, and Sorin custom tubing pack which specifically for this case, included a 3/8" x 3/8" venous arterial loop with bridge for reducing priming volume. The cardioplegia system used was the Sorin Vanguard which was set to deliver 1:4 Del Nido Cardioplegia. Inline blood gas monitoring system using the Terumo CDI 500 inline was also employed.

The circuit was CO2 flushed and then subsequently primed with plasma -lyte and 50 meq of Sodium Bicarbonate.

The Fresenius C.A.T.S continuous auto transfusion system was set up for skin-to-skin blood savaging. In consideration of the Jehovah's Witness Clinical Guidelines for reinfusion of autologous blood, it was imperative to set up continuous lines from the cell saver to both the perfusion system and the anesthesia central line, to ensure closed circuits with the patient's circulatory system.

In consideration of the Guidelines, no donor blood transfusion can be given, extra 250cc bottles of 5% albumin were accounted in the event of inadequate volume.

History

The patient is a 34 y/o male Jehovah Witness (JW) with a past medical history (PMHx) of end stage heart failure, atrial fibrillation, cardiomyopathy, congestive heart failure, left ventricular thrombus, arrhythmia, polycythemia and previous procedure of pericardial window, was admitted for heart transplantation. The patient had minimal previous intervention as a JW and had declined the support of an LVAD as bridge to transplant. As a result the patient was listed as class A1 on the heart transplant recipient list.

Pre-operative laboratory data showed the patient has a hematocrit of 48, platelet count of 208,000, K+ 4.4, Glucose 101, BUN 21, Creatinine 1.00, total albumin of 1.1, PT of 11.2, INR 1.0, PTT 44.4, Hemoglobin A1C of 6.3 and a blood type of B positive.

Events

Patient was heparinized with 300u/k heparin (30,000 units) and initiation ACT was 507 seconds. Arterial cannulation was performed with a Medtronic EOPA 20 Fr arterial cannula in the ascending aorta. Venous cannulation was completed bicaval with a 24 fr Medtronic DLP single stage venous cannula right angle metal in the SVC and a 28 fr Medtronic DLP single stage venous cannula right angle metal in the IVC. Pre bypass fluid balance were infusion of 500 ml and 350ml urine output. Just before retrograde autologous priming (RAP) 5,000 units of heparin were added to the pump. RAP was employed draining both the arterial and venous side of the circuit and a total of 500 ccs was replaced by patient's plasma. Arterial line pressure was then tested and proved to be appropriate. CPB was initiated and venous drainage was augmented by vacuum assisted venous drain (VAVD). Venous return was adequate and calculated flow was achieved. Once on bypass, 37.5 gm of Albumin and 37.5 gm of Mannitol were titrated. The patient was cooled to 34 degree C. Isoforane was used for the duration of CPB at 1.0 % or higher.

Continued on Page 12

Continued from Page 11

DelNido cardioplegia was used. High potassium levels were encountered during CPB and zero balance filtration (Z-BUF) was used successfully. Z-BUF technique used for this case was performed through use of the hemoconcentrator and adding a solution of plasma lyte, 25 meq of sodium bicarbonate and 200mg of calcium chloride to the reservoir. A total of 5 liters of Z-BUF were used throughout the case. Before the donor heart is implanted DelNido solution was infused directly into the donor heart coronaries to ensure further myocardial protection. The native heart was removed and the donor heart was anastomosed. The donor heart came from a patient in the mid 20's who died of an asthma attack and was not a JW. The heart was preserved using bridge to life solution.

Hematocrit remained above 35 for the entire case and negative base deficits of bicarbonate resulting in metabolic acidosis were treated with adding appropriately calculated amounts of sodium bicarbonate to the pump. Glucose levels remained within normal ranges during CPB and lactate levels reached a high of 1.9. Cerebral oximetry was used to ensure proper cerebral perfusion. Cerebral saturations maintained at or above baseline. Venous saturations, measured through CDI monitoring and with blood gases, never dropped below 75% indicating adequate tissue perfusion.

Once the donor heart was implanted the patient was rewarmed to 37degree C and "hot" shots of warm blood were given to the donor heart. At this time 2g of Magnesium and 100mg of lidocaine were given via the perfusion system. The cross clamp was then removed and the heart was checked for air via TEE.

The total ischemia time for the donor heart was 3.5 hours and through protocol recirculation on bypass was completed for 25 minutes, 10% of the ischemic time. Once circulation was completed the patient was given 1000mg of calcium chloride and weaned from CPB.

Total urine on bypass was 550cc and was further complemented with a total of 9600 cc of CPB ultrafiltration. The patient left the OR on drips of Epi/ Mil/ Dob and was hemodynamically stable. However, on post op day 1 an intra-aortic balloon pump (IABP) was inserted because of hemo-instability presenting with an EF of 35%. Once hemo-stability was regained the IABP was removed and on post op day 14 the patient was discharged from the hospital.

This case is somewhat unusual and controversial given the Guidelines that a JW will not accept any blood transfusions, blood products, support devices such as an LVAD and not even accept autologous blood if there is no continuous loop with their circulatory system, as shown with the cell saver. As a result, illustrated in this case, the patient is automatically elevated to class A1 recipients on the transplant list. Willing to accept donor organ and not willing to accept donor blood appeared to be in conflict with the Guidelines. The policy of JW recipients jumping ahead to the front of the waiting line should also be examined. The technique of volume control using oncotic agents prove to be very effective in this case and ,perhaps, should impact the routine cases for review and modification of protocol. In terms of blood management, perhaps, every case should be treated like a JW to reduce donor blood usage.

Citations

Yu Bai, Brian S. Castillo, Amanda Tchakarov, Miguel A. Escobar, Bryan A. Cotton, John B. Holcomb, and Robert E. Brown Providing Hemostatic and Blood Conservation Options for Jehovah's Witness Patients in a Large Medical System, *Ann Clin Lab Sci* November-December 2016 46:654-661

Sikorski, R. A., Rizkalla, N. A., Yang, W. W. and Frank, S. M. (2017), Autologous blood salvage in the era of patient blood management. Vox Sang. doi:10.1111/vox.12527

Stammers, Alfred H., Linda B. Mongero, Eric Tesdahl, Andrew Stasko, and Samuel Weinstein. "The effectiveness of acute normolvolemic hemodilution and autologous prime on intraoperative blood management during cardiac surgery." Perfusion (2017): 026765911770601. Web.

Strum, Earl, Nicolas Jabbour, Gagandeep Singh, and Rick Selby. "Transplantation in Jehovah's witness population: bloodless surgery allows options." Seminars in Anesthesia, Perioperative Medicine and Pain 23.1 (2004): 66-70. Web.

Jeong JY, Jee HS, Koo BS, Cho SH, Kim SH, Kim G. Liver transplantation in Jehovah's Witnesses: two cases report. Korean J Anesthesiol. 2017 Jun;70(3):350-355.

Notes

39th Annual Seminar of The American Academy of Cardiovascular Perfusion

New Orleans Marriott Hotel
New Orleans, Louisiana
January 17 – 20, 2018

(Tentative Program)

Wednesday, January 17, 2018

9:00 AM – 2:00 PM	Council Meeting
1:00 PM – 6:00 PM	REGISTRATION
3:30 PM—4:00 PM	Opening Business Meeting
	Fellow, Member, Senior and Honorary Members
4:00 PM – 7:00 PM	Special Breakouts

Thursday, January 18, 2018

7:00 AM	REGISTRATION
7:00 AM – 8:00 AM	Video Presentations
8:00 AM – 9:30 AM	Scientific Paper Session
9:30 AM – 10:00 AM	Break
10:00 AM – 12:00 PM	Special Scientific Session (Panel)
	Hot Topics and Current Trends
12:00 PM – 1:30 PM	Lunch

1:30 PM – 4:00 PM	Special Scientific Session (Panel) *Extracorporeal Support, In & Out of the Operating Room*
4:00 PM – 6:00 PM	Fireside Chats
6:00 PM – 9:00 PM	Sponsor's Hands-On Workshop & Reception

Friday, January 19, 2018

7:00 AM	REGISTRATION
7:00 AM – 8:00 AM	Video Presentations
8:00 AM – 9:30 AM	Scientific Paper Session
9:30 AM – 10:00 AM	Break
10:00 AM – 11:30 AM	Special Scientific Session (Panel) *Complex Congenital Heart Surgery*
11:30 AM – 1:00 PM	Lunch
1:00 PM – 3:30 PM	Special Scientific Session (Panel) *Education, Communication and Collaboration With Industry Partners*
3:30 PM – 5:30 PM	Fireside Chats
6:30 PM	Induction Dinner *All Attendees and Guests*

Saturday, January 20, 2018

7:00 AM	REGISTRATION
7:00 AM – 8:00 AM	Video Presentations
8:00 AM – 9:30 AM	Scientific Paper Session
9:30 AM – 10:00 AM	Break
10:00 AM – 11:30 AM	Special Scientific Session (Panel) *Expert Panel on Scientific Research*
11:30 AM – 1:00 PM	Lunch
1:00 PM – 3:30 PM	Memorial Session *Charles C. Reed Memorial Lecture - James MacDonald* *Thomas G. Wharton Memorial Lecture - James Beck*
3:30 PM – 5:30 PM	Fireside Chats
5:30PM	Closing Business Meeting *Fellow, Senior and Honorary Members Only*

THE ACADEMY TO OFFER LIVE WEBCAST

The American Academy of Cardiovascular Perfusion will again be offering a live webcast of our 2018 Annual Meeting in New Orleans. The General Sessions of the meeting will be broadcast in high quality streaming video. There will also be an opportunity for attendees to ask questions, thus qualifying for Category I CEUs from the American Board of Cardiovascular Perfusion.

2018 Annual Academy Meeting
Host Hotel

New Orleans Marriott Hotel
555 Canal Street
New Orleans, Louisiana

Single/Double Occupancy - $199.00 per night
Reservations: 800-228-9290
504-581-1000

Please mention that you will be attending the Annual Conference of The American Academy of Cardiovascular Perfusion when making your reservations.