The Academy NEWSLETTER

THE AMERICAN ACADEMY
OF
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SPRING 2012

Inside This Issue

33rd Annual Seminar of The American Academy of Cardiovascular Perfusion

Omni Royal Orleans Hotel
New Orleans, Louisiana

33rd Annual Seminar of The American Academy of Cardiovascular Perfusion

Omni Royal Orleans Hotel
New Orleans, Louisiana
January 26-29, 2012


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Awards Committee Selects Winning Paper Presentations

Three students received **Lawrence Awards** for their paper presentations at the Annual Seminar in New Orleans.

Seana Hall - Cardiac Power Output, Its Role in Defining Heart Failure For Future Mechanical Circulatory Support

Tyler Kelting - Air Bubble Detector Placement in the CPB Circuit: A 2011 Cross Sectional Analysis of Certified Clinical Perfusionists

Saba Riazati - Donation after Cardiac Death: New Application for Extracorporeal Membrane Oxygenation

The Lawrence Award is a $500 cash award for the best student paper presentations.

In addition, Jeff Riley was awarded the **Best Paper of the Conference** - a $750 cash award funded by the journal *Perfusion* for his presentation entitled, “Thromboelastography During Extracorporeal Membrane Oxygenation: Case Patterns.”

The Academy Recognizes Newsletter Contributing Editors at Annual Dinner


The “On Bypass” section of the Academy’s Newsletter first appeared in the Fall of 1990. Since then many Fellows have contributed to that section as either an author or a contributing editor including: Michael Sanford, Robert Groom, William Debois, Michael Hollingsed, Louis Brownstein, Al Stammers, John Bell and James Beavers.

There are several editors that have contributed for over ten years each and The Academy recognized them at the Annual Seminar in New Orleans. Those recognized were: *Sherry Faulkner* for her work as Contributing Editor of The AACP Newsletter for over 13 years, *Kelly Hedlund* for his work for over 18 years and *Thomas Frazier* for his continual dedication for over 21 years.

The newsletter also has a “Student Section” where student perfusionist can submit their studies or reports for publication. Making sure that we have a student article for each newsletter either by lining up submissions from the various schools or submitting something from his own program has been on ongoing project of Richard Chan and The Academy recognized him for his work as *Student Section* Editor of The AACP Newsletter.


Welcome to New Members

The American Academy of Cardiovascular Perfusion would like to welcome the following individuals whom were voted into membership at the Closing Business Meeting of our annual meeting in

Fellow Membership

Dana Apsel
Larry Baer
Michael Brewer
Stacey Brewer

Member Membership

Deborah Adams
Maimunci Baig
Stephen Catlett
William Christensen
Dan Davidson
Lian Huylebroeck
Ben Komoroski
Melody Maxim
Daniel Nauen
Elizabeth Pierce
Sue Thompson

Student Membership

Jijith Abraham
Bethany Armstrong
Whitney Behr
Wade Berger
Claire Bird
Ruth Burnette
Amanda Cerqua
Jessica Davidson
Gregory Davis
Katie Faella
Kelley Feather
Felicia Franceschelli
Jacob Gamez
Erin Grimm
Seana Hall
Todd Hietpas
Brittany Hunyadi
William Jones
George Kamukala
Thomas Kantner
Benjamin McClain
Stephen Miklas
Benjamin Mills
Yancey Mooney
Devin Munoz
Robert Murrell, Jr.
Can Nguyen
Evan Platt
Jayson Powell
Stephanie Radford
Saba Riazati
Clinton Seales
Ronald Smith
Michael Sullivan
Brian Temperley
R. Scott Thompson
Emily Thunstrom
Uriah Udgeon
Edward Whitehead

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The Student Section

Donation Platelet Rich Plasma Use in Cardiac Surgery as a Means to Improve Patient Outcomes

Kristen Grebenc

Midwestern University
Cardiovascular Science Program

Glendale, Arizona

Cardiovascular disease is the leading cause of death in today's society. According to the Centers for Disease Control and Prevention, "one in every three deaths is from heart disease and stroke, equal to about 2,200 deaths per day."[1] It is approximated that more than half a million heart surgeries are performed in the United States every year in an effort to manage many of these heart complications.[2] While cardiac surgery can be life-saving, the recovery these patients face after a procedure is lengthy with multiple factors contributing to the successfulness of their outcome. Patients may be faced with intraoperative or postoperative bleeding, pain and inflammation, and postoperative wound complications or infections associated with the vein harvesting site and sternal incision. In an attempt to combat these problems, vast amounts of research has been conducted over the past few decades. Platelet Rich Plasma (PRP) or Platelet Gel (PG), has been identified as an adjunct to other therapies in order to decrease the incidence of cardiac patient's intraoperative and postoperative complications.[3]

Platelet Rich Plasma (PRP) is an increased concentration of platelets floating in a small amount of plasma after being processed in a centrifuge. It is obtained by collecting the patient's own blood and placing it in a centrifuge where it is spun at varying speeds until it is separated into three layers. These layers include PRP, Platelet Poor Plasma (PPP), and Red Blood Cells (RBC).[3] PRP has a five-fold increase in concentration of platelets compared to normal blood. It is often derived from the patient's own blood and has been found to have a large number of growth factors and cytokines.[4]

Prior to cardiac procedures, blood from the patient is collected and the PRP is separated and then returned to the patient at the completion of cardiopulmonary bypass (CPB). This is done with the intention of decreasing the patient's need for allogenic platelet transfusions postoperatively.[5] While PRP can be sequestered and directly given back to the patient postoperatively, it is also common to see PRP transformed into Platelet Gel (PG). This process includes mixing the separated PRP with thrombin and calcium chloride.[3,6] These additions to the PRP activates the clotting cascade and produces the PG.[3] PG, whether through donated blood or autologous blood (forming autologous platelet gel (APG), has demonstrated its effectiveness in wound healing as a topical sealant and as an anti-infective.

Although there have been major advancements in cardiac surgery over the past few decades, bleeding continues to be a major complication and the need for blood transfusions still remains a chief concern.[5] According to Stover et al.,[7] patients undergoing coronary artery bypass grafting (CABG) procedures and other combined procedures such as CABG and valve repair or replacement, are at a higher risk for exposure to allogenic blood products. Much of this has to do with the insult on blood once it passes through the CPB circuit. This causes activation of platelets in the blood rendering them dysfunctional at their time of need postoperatively.[7] This platelet dysfunction is said to be the most common cause of nonsurgical bleeding af-

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ter CPB, and necessitates the use of allogenic transfusions to replace the platelets that are no longer viable.[7] While substantial advances in blood safety have been made over the past few decades, allogenic transfusions are still associated with risks. These include ABO- transfusion reactions, transfusion-related acute lung injury (TRALI), and bacterial contamination in platelet products, all of which have serious consequences for surgical patients.[8] As demonstrated in a study done by Stover et al.,[7] none of their patients that were in the aphaeresis group were transfused with allogenic platelets postoperatively. This decreased the risk of being exposed to blood products from between 6 to 8 donors for these patients as opposed to the control group who did not receive platelet sequestration.

Not only do blood transfusions have associated risks, but they are also a costly intervention. In a study by Murphy et al.,[9] they found an increase in morbidity associated with transfusions. This translated into longer hospital stays and increased admission costs. They came to the conclusion that if allogenic transfusion was not used as an intervention, well over 50% of all infections and ischemic events would have been prevented in their study population. This would have reduced the non-operative costs of an admission by approximately 40%.[9] In another study by Davies et al.,[10] it was concluded that cell salvage of the patient's blood and reinfusion of the blood postoperatively may be a cost-effective method to reduce exposure to homologous blood transfusions.

Methods have been put in place to harvest autologous PRP from patients before a bypass procedure and then transfuse this sequestered PRP to the patient at the completion of surgery.[5] "The concept of removing platelets from a patient immediately before CPB, thereby potentially sparing platelets many of the insults associated with CPB, followed by post-CPB platelet reinfusion, seems a reasonable approach to the problem of post-bypass platelet dysfunction and bleeding."[7] Ideally, the collection of the patient's blood should not be performed immediately preoperatively as it needs time to process and could decrease the patient's hemoglobin level just prior to the procedure. This is considered a limitation in emergency cases; however, sequestration can be done successfully in non-emergent instances and reinfusion of PRP can provide better patient outcomes after cardiac surgery.

As mentioned previously, platelet gel is an activated form of PRP and is formed by combining the platelet concentrate with bovine thrombin and Calcium Chloride (approximately 10 parts PRP mixed with 1 part thrombin/10% CaCl2).[3,11] It is especially useful as a topical sealant and for wound healing with infection prevention/treatment characteristics. In clinical studies, patients undergoing either CABG or aortic surgery receiving APG application on their anastamosis sites had better hemostasis of those sites than the control group (not receiving APG).[11] These results support the use of PG as a topical sealant in cardiac procedures.

Also, through multiple studies and research it has been discovered that PRP contains heightened concentrations of growth factors, which are involved in the key stages of wound healing and tissue regeneration.[3,4] Once the PRP is activated to form the PG, these growth factors are released and take action on the desired site they are applied to. The multiple cytokines and mediators such as platelet-derived growth factor (PDGF) that are present in PG promote angiogenesis and collagen synthesis, which enhances soft tissue would healing.[11] The increased growth factor concentrations are largely responsible for the accelerated soft tissue wound healing that is about 2-3 times faster than normal healing.[3] PDGF is "an activator of collagenase within the later stages of wound healing, allowing for remodeling of collagen to promote wound strength. These function in attracting additional platelets to the developing clot, thus, enhancing the hemostatic response."[11]

In addition to a more rapid patient healing response after surgical procedures, the application of PG in cardiovascular surgical closure could result in reduction of post-operative wound complications.[12] In a retrospective case series, a significant reduction in wound healing disturbances of the chest and leg were demonstrated when PG was applied during cardiothoracic procedures. "In over 1000 patients having saphenous vein harvest, postoperative drainage of the leg wound was seen in 10.2% of the PRP cases and 46.1% of the controls (P< .001)."[12, 13] Platelet-rich gel has also been found to have an antimicrobial effect against various strains of bacteria. These include Escherichia coli and two strains of Staphylococcus aureus (MSSA and MRSA), which are major causes of hospital acquired infections in surgical wounds.[14] Deep Sternal Wound Infections (DSWI) are just one of the many debilitating and life-

threatening complications that patients may face if they acquire an infection in their surgical wound after a cardiac procedure.[15] The use of PG to accelerate wound healing, epithelialization, and formation of tissue granulation has been demonstrated to be beneficial for those patient's that have compromised healing ability.[15] In a study by Kachel et al.,[15] a four week long, non-healing DSWI after cardiac surgery was treated by injecting platelet gel into viable tissue at the wound site. After two weeks time and with only PG treatment, tissue granulation indicating healing was visible. PG releases growth factors over the next 7-10 days continuing it's antimicrobial and healing activities.[11]

So how can perfusionists get involved? As perfusion is a critical part of any open-heart team, there are many opportunities to advocate the use of PRP or PG. This includes on anastamosis sites,[11] conduit harvesting sites,[12,13] sternal incision site, and in the postoperative environment of the Cardiac Care Unit (CCU) as a means of preventing infection or treating infected surgical wounds.[14,15] It is crucial that perfusionists educate practitioners on the benefits and ease of PRP and PG use. The processing time of the autologous blood can take as little as 30 minutes and provides anesthesia with the option of returning the remaining PPP and RBC's to the patient.[11] The resulting PRP that is obtained is stable in the anticoagulated state for approximately 8 hours. At this time the surgeon can determine whether it should be activated to produce PG, and this gel is simply applied to the desired site by the surgical team. The advantages range from antimicrobial effects on surgical sites to increased healing time with decreased scarring and inflammation and therefore better overall patient outcomes.[3,11]

While there have been many successes with the use of PRP and PG, there are still some studies that show inconsistencies. With the many benefits that PG offers (superior patient outcomes, cost benefit for patient and hospital, etc.), it is without question that it should be researched further in hopes that it will one day become the new standard of practice for cardiac procedures.

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ON BYPASS

CARDIAC POWER INDEX: STAGING HEART FAILURE FOR MECHANICAL CIRCULATORY SUPPORT

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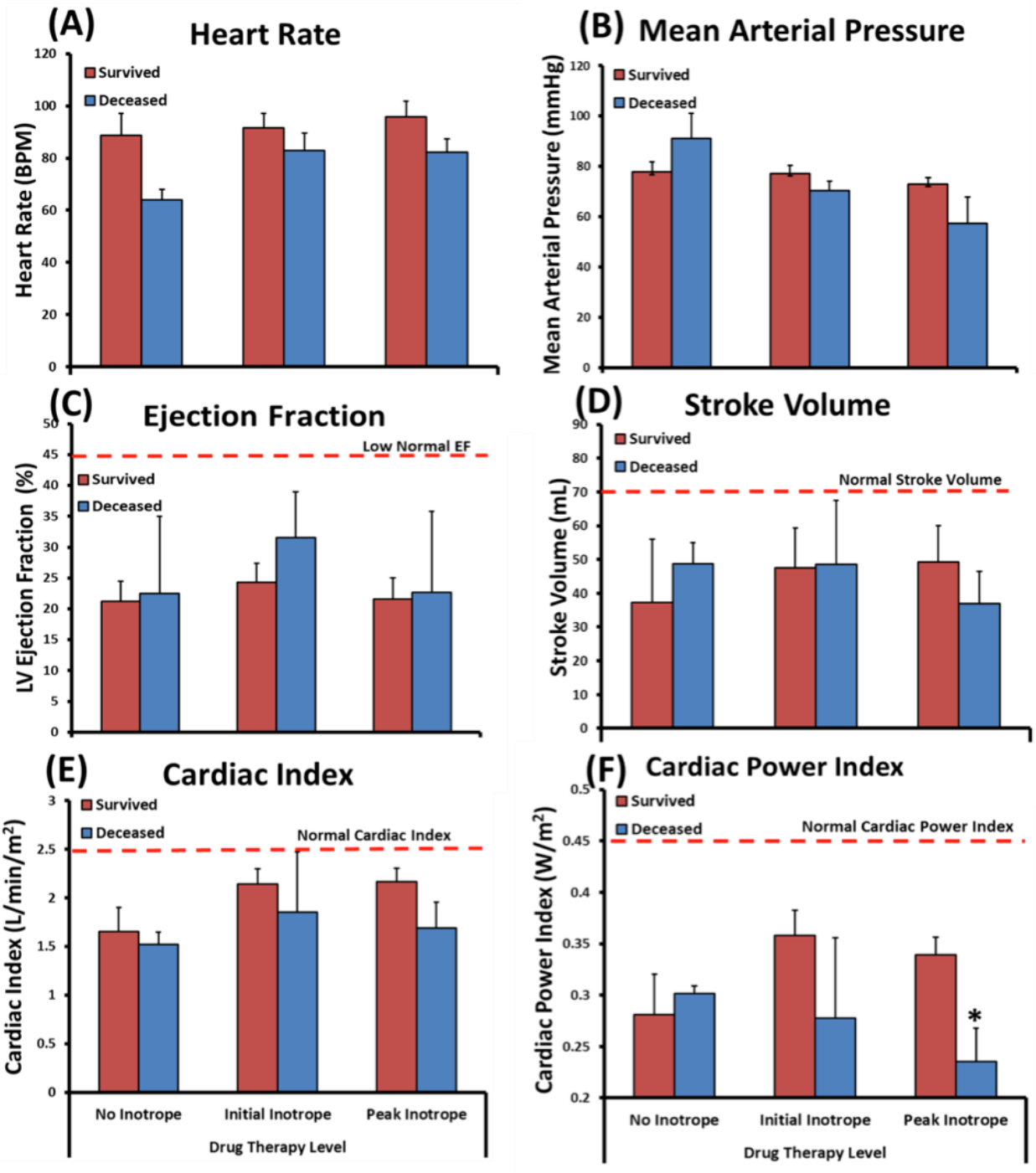
Options for heart failure treatment are limited. Patients are first placed on standard heart failure medications to reduce symptoms. The administration of these therapeutics in the deteriorating heart provides inotropic support in order to enhance the perfusion demands of the body. Eventually inotropic drugs no longer become efficacious and patients must be considered for heart transplant or mechanical circulatory support; however, mechanical circulatory support is only effective if implemented before the long-term effects of heart failure become detrimental, causing extensive end-organ damage. Our study is focused on staging the heart failure patient by assessing heart failure severity. Currently, myocardial oxygen consumption measured through dobutamine infusion or exercise tests is most often used to assess the severity of heart failure, since myocardial oxygen consumption is an indirect measurement of cardiac output. While cardiac output is a valuable marker, it does not provide the critical data in the maintenance of effective end-organ perfusion and that will relate to patient survival.

Cardiac power output is the hydraulic energy required by the heart to provide enough blood flow to the systemic circulation. Cardiac power output can by normalized to account for body surface area as cardiac power index. Cardiac power index reflects total cardiac performance because it is a function of both pressure and flow: CPI = MAP x CO x 0.0022 ÷ m^2. When measured at exercise, cardiac power index reflects the peak cardiac performance attainable by the heart. Comparing maximum with resting cardiac power index represents cardiac reserve. In heart failure patients, cardiac reserve is severely limited. Cardiac power index, as a representation of cardiac reserve, was compared to other commonly used hemodynamic parameters to validate its usefulness to stage heart failure patients and determine the optimal time for implantation of mechanical circulatory support.

Heart rate, mean arterial pressure, ejection fraction, stroke volume, cardiac output, and cardiac power output, and cardiac power index were compared in a retrospective study of twenty-eight heart failure patients implanted with mechanical circulatory support. Patients in NYHA classes III and IV were analyzed at three levels of drug therapy: no inotropic drug therapy, initial dose of inotropic drugs, and maximum prescribed doses of inotropic drugs. Subjects were further separated into two categories: survived versus deceased. Cardiac power index was the only statistically significant hemodynamic parameter that identified cardiac reserve. These results showed that a cardiac power index at or below

0.34 Watts/m^2 resulted in increased mortality, ninety days post-implantation.

Patients with end-stage heart failure ultimately face a difficult decision: whether to wait for a heart transplant or receive mechanical circulatory support until a heart is available or as destination therapy. Due to the limited availability of heart donors today, mechanical circulatory support is becoming more of a necessity; however, it is useless unless heart failure intervention has occurred before terminal end-organ damage has occurred. Cardiac reserve was found to be a determinant of post-device survival; therefore, these data suggest that device implantation should occur prior to the 0.34 Watts/m^2 threshold.



All About our Corporate Partners

Spectrum Medical M4 Discussion: Non-Invasive pO_2 and pCO_2 Measurement Used in Extracorporeal Bypass Procedures

A White Paper Prepared By:

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Engineering Design Director
Spectrum Medical, Ltd.

Stephen B. Turner
President and CEO
Spectrum Medical, Ltd.
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Introduction

This white paper has been prepared in order to discuss the market introduction and clinical implications of Spectrum Medical's new M4 diagnostic monitor. The new M4 extends the range of non–invasive diagnostic measurements, already available with the current M2 and M3 products, to include the key parameters: pO_2, pCO_2, and associated measurements.

Collectively the range of the M2, M3, and now the M4 diagnostic monitor has been constructed using Spectrum Medical's standardized system M technology platform which, at its core, has the commitment to being non-invasive, real-time, and easy to use.

This paper is divided into the three following sections:

I. The evolution of the system M range of diagnostic monitors from the early M2 to the newly introduced M4.

II. A description of the new M4 gas measurement hardware and the principles used in the technology.

III. The benefits of this new system over the competition in the market place.

IV.

Pictured: the new M4 System Monitor

I. The System M Evolution

Overview of the System M Monitor

The monitor itself weighs 4.5 kg and is a self contained embedded PC with a 294mm touch screen, for user input, and a custom PCB (Printed Circuit Board). A built-in battery backup eliminates the need for a UPS (Uninterruptable Power Supply). High quality Lemo connectors are used throughout the product. The casing is die cast aluminium which produces a robust and reliable device. The device is attached to the extracorporeal pump set -up via a quick release mounting arm.

Additional connectivity via LAN, WiFi, serial RS232, and RS485 are catered for and user data can be stored and removed via an SD card. All of this is controlled, displayed, and processed by custom built software written by Spectrum Medical.

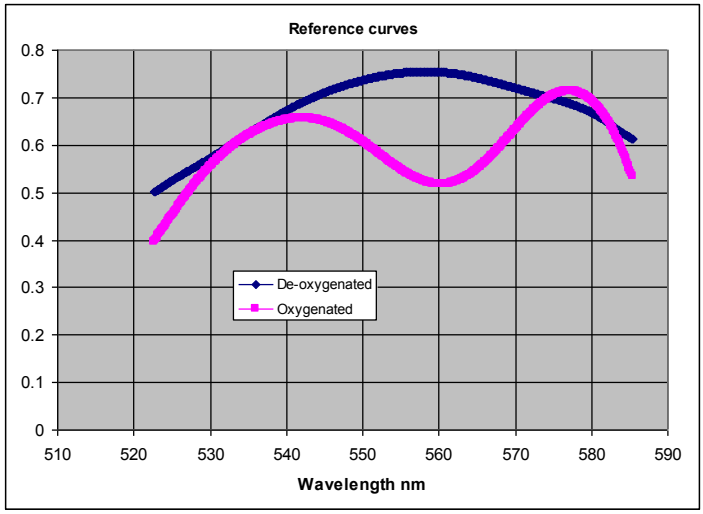
The monitor allows the user to display a choice of digital gauges and graphs which are all highly customisable to the customer's preferences, including names, colours, and positions. Each of the measurements has alarm settings and unit selection and most have the Spectrum synchronisation feature that allows for adjustment of the reading to match the local blood gas analyser.

M2 Monitor

The M2 was the first of Spectrum Medical's new generation of non-invasive diagnostic monitors using sensors that clip-on to the extracorporeal bypass tubing. The M2 has the capability to measure oxygen saturation and

hematocrit/haemoglobin concentration of blood contained within an extracorporeal tube.

Using a miniature scanning spectrometer and a near infrared light source, the system measures the reflected amplitude of light at 100 discrete wavelengths. A specially developed algorithm, while compensating for temperature, derives the relative contributions from both the fully oxygenated and the reduced oxygenated absorption curves to calculate an actual O2. The physiological oxygenated and deoxygenated saturation curves once referenced to a blood gas system will not drift and therefore do not require further calibration.



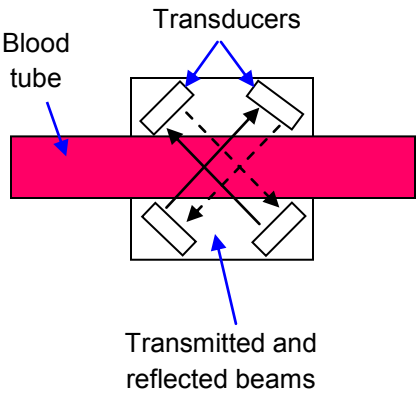
For the measurement of hematocrit or haemoglobin the M2 monitor uses a non-invasive arterial sensor assembly that contains an emitter and a photo diode receiver that works in the NIR (Near Infrared Range) region. NIR from an LED is passed through a flowing tube of blood. The photo diode detects a receiving light level and converts the resultant light energy into a proportional electrical output. Using a centrifuge technique the sensor is pre-calibrated with known high and low calibration values. Software algorithms linearize this relationship and convert the incoming to an actual value of hematocrit or haemoglobin.

M3 Monitor

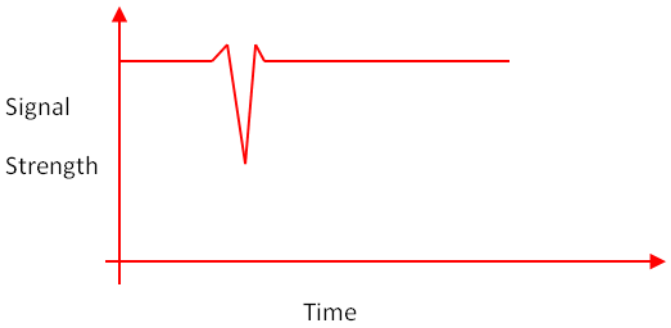
The two channel measurement of blood flow and emboli detection was added to the system M technology platform in 2007. These added parameters, along with the M2's saturation and hematocrit measurements are packaged as the M3 Monitor.

The M3 product is capable of measuring two independent flow channels, each with flow and emboli detection. Once again the Spectrum sensors clip on the outside of the blood tube. Both blood flow measurement and emboli detection is determined using ultrasonic sensing technology. The sensor system uses ultrasonic signal phase variations to determine actual flow rate(s) and uses direction and changes in ultrasonic signal amplitude to detect emboli. This means that these two measurements, although read by the same sensor, are truly independent of one another. Flow differential and cardiac index can also be obtained as a result. Independent alarm levels for all of these measurements, including flow differential, can be set-up by the clinician.

Non-invasive flow sensors



What an emboli looks like to the sensor



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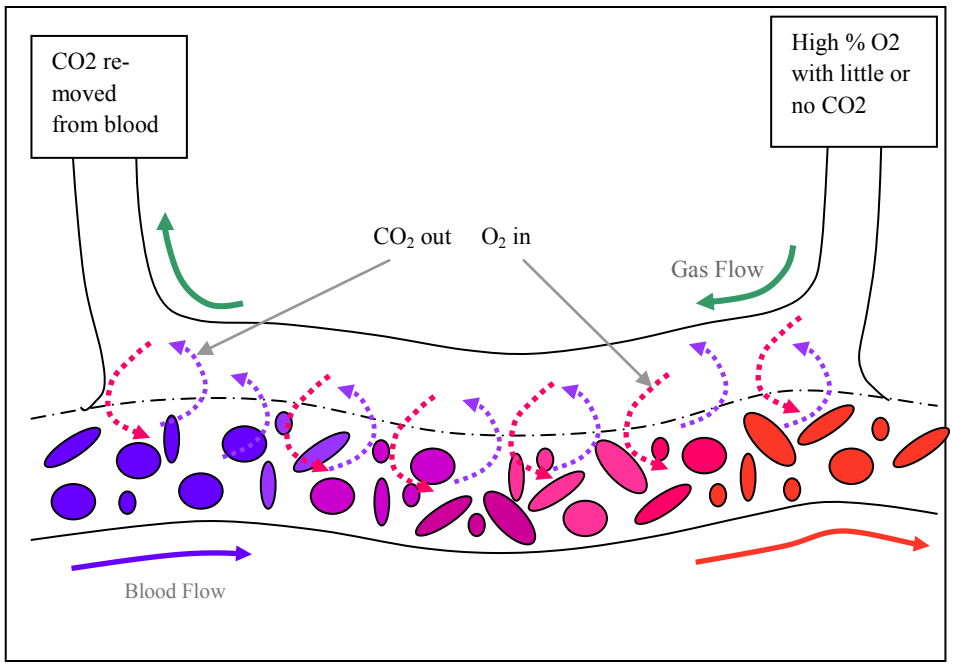
The New M4 Monitor

During the past two years Spectrum Medical has focused its development activities on a new technology for the non–invasive measurement of extracorporeal gas delivery and the measurement of patient pO_2 and pCO_2. Within Spectrum Medical this technology is built with what is called the Gas Measurement Module which is pictured and detailed on the right.

II. M4 Gas Measurement Module: How and Why it Works

The principles of operation for the new gas module are relatively well known to those who have used similar capnography techniques. The oxygenator, in a perfusion system, is there to both oxygenate the flowing blood and at the same time remove as much CO_2 as possible. The oxygenator allows blood and gases to pass each other and allows the gas pressures to equalise during this contact. Therefore the gas mix entering and leaving the oxygenator can tell us what the equalised conditions are. The M4 system monitors the condition of gases entering and leaving the oxygenator. Furthermore, these conditions are then recognized as a function of the pO_2 and pCO_2 totals in the patient's blood leaving the oxygenator.

The mix of O_2, nitrogen, and CO_2 will change gradually as both the gas and blood pass each other within the oxygenator. There is an abundance of oxygen in the line so the amount of oxygen used from inletto outlet will be minimal, therefore reading the O_2 percentage at inlet is sufficient to predict the pO_2 value in the blood leaving the oxygenator. The amount of CO_2 leaving in the gas exhaust however will be much higher than the inlet so the CO_2 in the exhaust port is measured. As there are circumstances when CO_2 is added to the gas line, a CO2 sensor is



placed in the inlet line on the oxygenator to cater to this condition. These O_2 and CO_2 sensors form the basis of the pO_2 and pCO_2 measurements and provide FiO_2, $FiCO_2$ and exhaust measurements.

However, for accurate pO_2 and pCO_2, it is not that simple and in this case knowing the actual real–time performance of the oxygenator (or more accurately its efficiency) is an important variable within the sophisticated measurement algorithm. Oxygenator efficiency is dependent on a large number of variables that include blood flow rates, gas flow rates, circuit temperatures, and simple variations in circuit set up. The Gas Measurement Module includes an array of dedicated sensors (including atmospheric pressure measurement) and when combined with the stand alone CO_2 exhaust sensor, is able to determine actual pO_2 and pCO_2.

III. Competitive Benefits of the M4

As with all of Spectrum Medical's products, the M4 remains a non-invasive system. From a competitive standpoint this is a strong starting point for justifying its preferred clinical use when compared to other products in the market. The main competitor to the M4 is the Terumo CDI 500 device which requires one, or more normally, two sterile cuvettes to be inserted into the blood tube.

The CDI 500 also requires continuous calibration during bypass to ensure that measurements are kept within acceptable limits. The M4 has been designed to allow the user to synchronise its values to a blood gas sample but does not require regular calibrations, in fact once per case at the start of the case is usually sufficient. It is also possible that case to case synchronisation may not be needed.

Another core commitment Spectrum brings to all of its products is the real-time delivery of clinical information. As the gas measurement module measures gas parameters which tend to change very quickly the measurement module is designed to react in real-time to any changes occurring. These changes may be due to either the settings made by the user or changes in the condition of the patient where speed of critical care can make a significant difference in clinical outcomes.

In addition to the sensors that read the gas conditions to and from the oxygenator, the M4 also provides secondary monitoring of gas and gas supply failures that can occur due to pipe occlusions, disconnected pipes, and pinched pipes. These conditions can be alarmed if required. Gas flow rates can be sanity checked with blenders, as can blood flow rates with pump heads. All of these conditions may be detected by other means, but the M4 will detect them sooner and with less equipment attached to the pump cart.

Summary

With the addition of the new gas measurement module to the M2 and M3 range of measurements the M4 is the only non-invasive monitor on the market that provides a wide array of measurements all displayed utilizing one system. It is also the only system that is portable with quick and easy set-up, requires no or minimal calibration, and provides immediately available accurate and real-time readings. Each of the parameters can also be graphed and configured to alert the clinician when a designated parameter is out of limits. The clinical implications of the M4 include more efficient patient care, increased patient safety, and better clinical decision support.

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Gaseous Microemboli During Cardiopulmonary Bypass

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Gaseous microemboli and their impact on both patients and families after cardiac surgery is a problem that has been around since the development of the first extracorporeal oxygenator, most likely reaching its peak during the years of bubble oxygenation. The past few decades have seen the development of newer membrane technologies and the use of new ultrasound devices to detect gaseous microemboli within the extracorporeal circuit of both the laboratory and the operating room. This has led to a surge of in vivo and ex vivo evidence based literature examining the potential sources of this 'invisible' problem. Subsequently, this allows clinicians to make more critical choices in the operating room, and industry to have a more focused area of development in their quest for the most optimal form of circulatory support.

Therefore it is important that clinicians not choose extracorporeal devices that focus solely on reducing priming volume over the importance of reducing GME post arterial filter … since both of these issues have consequences that can negatively impact on our patient's lives for years to come. The ultimate goal of all clinicians involved in the application of extracorporeal circulation (ECC) is to achieve an optimal balance of extracorporeal mechanics with circulatory physiology in a way that has the least impact on the patients in our care. The understanding and avoidance of GME should be just as important in our daily practice, as is the understanding and avoidance of excessive hemodilution and macro air (1). Using oxygenators and filters that provide small decreases in prime volume but allow significant increases in GME post arterial filter, is certainly not in the best interest of patients undergoing cardiac surgery.

Neurocognition is a term used to describe the cognitive functions of the brain that are closely linked to specific areas, neural pathways, or cortical networks in the brain. Neurocognitive dysfunction is associated with impaired memory and quality of life after cardiac surgery. Advanced age and diabetes predispose some patients to neurocognitive dysfunctions, as do gaseous microemboli during the course of bypass. Neurologic injury is a significant risk for adult patients undergoing cardiac surgery, and may be present in two thirds of the patients six months after discharge and 42% of patients after 5 years (2). The spectrum of short and long term neurologic injury involves such morbidities as stroke (0.8%-5.2%), neurocognitive changes such as mental confusion, memory loss and lack of concentration (24-57% at 6 months), depression, encephalopathy, delirium, and confusion (≈10%) (3). The morbidity associated with neurocognitive dysfunction should not be considered as a normal part of CPB because many patients do not experience this morbid effect. However, those that do can experience long lasting and devastating dysfunctions which impact both patients and their families alike.

In all cardiac surgery programs, it is the surgeon who makes the ultimate decision on a programs growth and issues that affect patient safety. However, they are not always capable of staying current with GME information and the equipment and techniques that affect their patient population. For this, they rely on the perfusionist who obtains this information from professional research, peer reviewed journals and professional

meetings ... and is therefore expected to interact with the medical staff in their program to inform them of new extracorporeal information that relates to their patients outcomes and safety. In other words, GME during cardiopulmonary bypass can frequently go unnoticed, until someone speaks for the patient and moves the practice in a direction that will help to reduce post bypass neurocognitive dysfunctions.

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(Gerard Meyers, RT, CCP has worked in Halifax, Nova Scotia, Canada, as a perfusionist for 31 years. The article is excerpts from his newly released book (October 2011) by Sorin Group entitled 'Gaseous Microemboli during Cardiopulmonary Bypass'. Please contact your local Sorin Cardiopulmonary Account Executive if you are interested in further discussions concerning GME or would like to receive a copy of his recently published book.)

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