INVESTORS

INVENTORS

UCLA MEDICAL DEVICE PARTNERING CONFERENCE

TUESDAY, MARCH 11, 2014

CNSI-UCLA CAMPUS 10AM-3PM

INDUSTRY





I would like to welcome you to UCLA's 2nd Annual Medical Device Partnering Conference. We are excited to have you join us for this opportunity to share, first-hand, the continuing efforts to address ongoing challenges and unmet medical needs. This year we are pleased to partner with innovation centers throughout Southern California to highlight initiatives and opportunities from around the region.

We are pleased to share with you the advances that are happening in the areas of wireless health, cardiology, ophthalmic devices and minimally invasive devices. The world-class research occurring in the Southern California region continues to push scientific boundaries in impactful ways.

We hope that this event will provide you with greater insight into the tremendous caliber of research, as well as the exciting entrepreneurial endeavors, emerging in the medical device arena. Our vision for this event is to provide a venue for you to connect with peer inventors, investors and industry to open new avenues for creativity and commercialization. Thank you for joining us.

Sincerely,

Brendan Rauw Associate Vice Chancellor and Executive Director of Entrepreneurship

Conference Program

9:15 am	Registration/Networking
10:00 am	Welcome—Emily Waldron Loughran
10:05 am	ADVANCING BIOENGINEERING INNOVATIONS (ABI) PROGRAM Jennifer McCaney, PhD
10:15 am	HEALTH SYSTEMS PANEL Medical Device Purchasing in the Managed Care Era UCLA Health I UCI Medical Center I Children's Hospital Los Angeles
11:15 am	INDUSTRY PANEL Engaging Industry for Collaboration RCT Ventures Abbott Medical Optics Cook Medical
12:15 pm	Lunch
1:15 pm	TRENDS IN WIRELESS HEALTH Majid Sarrafzadeh, Co-Director, UCLA Wireless Health Institute
1:45 pm	NETWORKING OPPORTUNITIES Wireless Health I Cardiovascular I Ophthalmic Devices I Minimally Invasive Devices
2:15 pm	STARTUP COMPANY PITCHES Holomic, LLC CytoVale, Inc. EP Dynamics, Inc. Neural Analytics

3:00 pm Networking/Event Close

Conference Exhibitors

INSTITUTIONS

Children's Hospital Los Angeles LA BioMed Long Beach City College UC Irvine UCLA USC

COMPANIES

Aubrey Group, Inc Dinsmore and Associates, Inc EP Dynamics, Inc Holomic, LLC Isis Services, LLC MediSens Wireless, Inc Neural Analytics Stryker

Highlights of UCLA Medical Device Commercialization

UCLA has a history of success in the development of medical devices that have been brought to the marketplace for the benefit of the public. This history started with the Nicotine Patch developed by Murray Jarvis and Jed Rose of UCLA, which was first commercialized in 1992. The patch was followed closely by the hugely successful **GDC® Coil (Guglielmi Detachable Coil)** developed by Dr. Guido Guglielmi from the Department of Radiology. Innovation in the area of stroke continued with the **MERCI®** clot retriever coil developed at the UCLA Stroke center.

Other examples of UCLA devices that have made it to the market are the ductal lavage catheters for early detection of breast cancer and a blood coiling device used in emergency room settings.

The innovation continues today with a next generation of products which have received regulatory approval and are ready to enter the marketplace. Examples are the TNS Stimulation Device for treating depression, which recently received a CE mark in Europe and the **Air Bloc™** system to prevent fatal air embolisms in left heart procedures.

Highlighted and bolded devices are on display at this conference in the CNSI Lobby

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Nancy Blake, PhD, RN, CCRN, NEA-BC, FAAN

Director, PCS Critical Care Services Children's Hospital Los Angeles

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Nancy Blake RN, PhD, CCRN, NEA-BC, FAAN, has been the director of critical care services at Children's Hospital Los Angeles for over 20 years. Nancy is also Associate Adjunct Professor at UCLA School of Nursing. Nancy has been an active member in the American Association of Critical Care Nurses (AACN). She was on the national board of directors from 2003–2006, serving as the treasurer in 2006. Prior to that she was the LA AACN Chapter President. Nancy is a nationally recognized speaker on Healthy Work Environments, Leadership and Management, and Pediatric Disaster Preparedness and has many publications on disaster preparedness and the role of nursing and Healthy Work Environments. Nancy has been involved in setting standards for pediatric disaster preparedness at the local, state and federal level, most recently participating in a CDC work group setting standards for pediatric critical care mass casualty which were published in 2011. She received her BSN from Mount Saint Mary's College in Los Angeles, she received her MN from UCLA in Nursing Administration, and most recently received her PhD in nursing at UCLA, doing her dissertation on the Relationship between Healthy Work Environments and Patient Outcomes and Nurse Outcomes. She was inducted into the American Academy of Nursing in October of 2013.



Bruce Gingles

VP, Global Technology Assessment and Health Policy Cook Medical

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After earning a BA (biology) from Indiana University, Bruce was hired in 1979 and relocated to Los Angeles to be Cook's first sales representative for the newly formed Critical Care division. He moved to Northern California (Mountain View) in 1984 as Regional Manager, to Bloomington in 1991 as Director of Sales and Marketing, and was promoted to Global Business Leader and Vice-President, in 1999. Bruce now represents Cook in the areas of translational research, commercial regulation, and technology assessment. The ethical foundation of commercial relationships and translational algorithms are personal interests.

Bruce serves on the external advisory committee for the Indiana University and UCSF (devices) CTSIs. He has been invited to discuss translational research and medical device innovation at more than 30 CME/CLE-accredited programs in the US, Europe, and Asia.



Miles S. Gerson, JD, MBA Managing Officer, Business Development UCLA OIP-ISR

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Miles Gerson joined UCLA's OIP-ISR in 2012 as the Managing Officer for Business Development. In this role, he serves as public representative for the Office, helping to promote UCLA intellectual property, identify potential industry sponsors, and expand licensing, spinout & entrepreneurial activity at UCLA. Prior to UCLA, Miles helped to launch Surefire Medical Inc., a medical device company in Colorado, and served as an analyst for multiple investment firms including, High Country Venture, the CSU Management Fund, a venture fund for emerging research at Colorado State University, and Dag Dvergsten AS, a private equity/venture firm based in Oslo, Norway. Miles holds a JD/MBA from the University of Wisconsin, Madison, where he specialized in strategic management in life and engineering sciences, and worked with WARF to help guide the commercialization of academic research. Miles also holds Bachelor's and Master's degrees in Neuroscience from Wesleyan University.



Paul M. Grand Managing Director RCT Ventures

PGrand@rctech.com

Paul M. Grand is a Managing Director for RCT Ventures. At RCT, he is responsible for sourcing RCT's investments in medical devices and representing RCT on the boards of its portfolio companies. Grand serves as Producer and Master of Ceremonies for the annual MedTech Idol competition that seeks to identify outstanding early-stage MedTech opportunities.

Grand has extensive experience in new company formation and operations. Prior to joining RCT, Grand founded and operated eight high technology, medical device, and biotechnology companies. In the life sciences, Grand was co-founder and VP of Operations of Imagine Pharmaceuticals, and co-founder and CEO of MicroSurgeon in Los Angeles.

Grand is actively involved in programs to encourage bio-entrepreneurship, innovation, and commercialization of University technologies. He is on the Oversight Committees for the Coulter Translational Research Partnership Programs at USC and University of Washington. Grand is a reviewer for proof of concept and commercialization-focused funding programs for the University of California system, USC, University of Utah, and University of Colorado.



Andrew Kaufman Financial Decision Support Analyst UCLA Health System

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Andrew has worked for UCLA Health System in Decision Support as part of the Finance Department for 6 years. His main responsibilities focus on operational analysis and improvement. As part of his duties he represents the Finance department on the Value Analysis Committee, which oversees access to new technologies and products at UCLA's hospitals.

Andrew holds a BS in Biology from Duke University, and an MBA with a focus in Finance from the University of Southern California.



Emily Waldron Loughran

Director of Licensing UCLA OIP-ISR

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Emily Loughran joined UCLA's OIP-ISR in 1994 as a technology transfer officer. Currently, as the Director of Licensing, she manages the licensing and patent prosecution groups, and oversees the office's large portfolio of invention disclosures, patents, and license agreements. Emily started in intellectual property administration at the City of Hope Medical Center where she was the Technology Transfer Manager responsible for patenting and licensing activities. Emily holds an MBA from USC and a BS from UC Berkeley.

Jennifer McCaney, PhD

Senior Fellow, Advancing Bioengineering Innovations Program UCLA Business of Science Center

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Jennifer McCaney is a Senior Fellow at the UCLA Business of Science Center (BSC), which sponsors the Advancing Bioengineering Innovations Program for entrepreneurship in medical device design, as well as assists university faculty and physicians in commercializing their research. Jennifer holds a Lecturer position at the Anderson School of Management where she teaches a course on emerging technologies in healthcare. Jennifer is a co-founder of Hourglass Technologies, Inc., which developed the TRIM[™] System, a nonsurgical obesity device. A Fulbright Scholar, Jennifer completed her PhD in Mechanical Engineering at Stanford and holds a master's and undergraduate degrees from MIT and the Sloan School of Management. Prior to joining the BSC, Jennifer worked as a consultant to biotech and pharmaceutical companies at Clarion Healthcare.



Majid Sarrafzadeh, PhD

Professor, UCLA Computer Science & Electrical Engineering Co-Director of Wireless Health Institute Co-Director of BRITE center on Minority Health Disparities

www.cs.ucla.edu/~majid

Majid Sarrafzadeh received his PhD in 1987 from the University of Illinois at Urbana-Champaign in Electrical and Computer Engineering. He joined Northwestern University as an Assistant Professor in 1987. In 2000, he joined the Computer Science Department at University of California, Los Angeles (UCLA). He is a co-founder and co-director of the UCLA Wireless Health Institute (WHI) and a co-director of BRITE center on Minority Health Disparities. His recent research interests lie in the area of Embedded Computing with emphasis on healthcare. Dr. Sarrafzadeh is a Fellow of IEEE. Professor Sarrafzadeh has published approximately 450 papers, co-authored 5 books, and is a named inventor on many US patents.

Dr. Sarrafzadeh has collaborated with many industries in the past 25 years. He co-founded two companies around 2000, which were both acquired around 2004. He has recently co-founded several companies in the area of Technology in Healthcare.



Cynthia Winner, RN, MSN, NE-BC

Senior Director, Clinical Services UC Irvine Medical Center

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Cynthia Winner has been the Senior Director of Clinical Services at UCI Medical Center for over 17 years. She has worked in both the inpatient and outpatient area. Currently she is responsible for the overall planning, development, coordination, implementation, and management of all clinical services and related business development activities of the Neuropsychiatric Hospital, Cardiology and Neurodiagnostics Service Lines, Beckman Surgery Laser Center, and Occupational Health. Cynthia contributes to the development and implementation of major strategic direction for the system and provides direction and vision for all aspects of patient care. She is an Assistant Clinical Professor in UCI Nursing Program, and a member of the Capital Equipment Committee.



Troy Wu, MD Director of Business Development Abbott Medical Optics Inc.

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Troy joined Abbott Medical Optics in 2013. Prior to joining Abbott Medical Optics, Troy worked in Deutsche Bank's healthcare investment banking practice where he advised biotechnology, pharmaceutical, and medical device companies on numerous mergers, acquisitions, and financing transactions. He began his career in corporate finance at Cowen & Company and Houlihan Lokey.

Troy received his BS degree magna cum laude in Business Administration from the University of Southern California, and his MD from the Keck School of Medicine of the University of Southern California, where he graduated with high honors. He also trained in anesthesiology and critical care at Stanford Hospital and Clinics. Throughout his academic career at Stanford and the Keck School of Medicine at USC, he has authored several peer reviewed articles and abstracts.

Cytovale

Dino Di Carlo, PhD

Founder, CytoVale www.cytovale.com

CytoVale is pioneering a new class of biomarkers. Disease states dramatically alter cells' mechanical properties through changes in nuclear and cytoskeletal structure. Until now, it has been impossible to measure these changes quickly and reliably enough to translate basic research observations into clinical utility. Using microfluidics, CytoVale can measure >10 biophysical cell markers at rates >2000 cells/second, providing a high throughput, low cost method of detecting disease. This Mechanomics Platform, consisting of a benchtop instrument and disposable diseasespecific sample cartridges, has been academically validated with clinical samples in the laboratory of co-founder (and UCLA Professor) Dino Di Carlo. Commercialization is driven by CEO Ajay Shah, PhD, a successful entrepreneur and an expert in cellbased diagnostics from his doctoral work (Harvard & MIT), COO, Mara Macdonald, PhD, and technology co-inventors Daniel Gossett, PhD and Henry Tse, PhD. Cytovale is initially developing its technology for the early detection of sepsis.



Gary J Sterling

CEO, EP Dynamics, Inc. www.ep-dynamics.com

EP Dynamics is an emerging cardiovascular medical device company focused on developing, acquiring, manufacturing, and marketing proprietary products to serve the interventional cardiac electrophysiology market. EP Dynamics was founded in 2008 by Kalyanam Shivkumar, MD, PhD, and George Kick, to secure an exclusive license from the University of California, Los Angeles, to develop and commercialize products based on the "AirBloc" patent. The "AirBloc" technology is uniquely designed to significantly reduce procedure risks and complications, like stroke and neurological deficits, during cardiac interventional procedures. EP Dynamics has an experienced management team to execute aggressive company growth plans. Funds were raised and products have been developed, tested, clinically validated, and now, FDA 510(k) cleared to sell AirBloc featured products in the United States.

EP Dynamics has additional proprietary technology and important new products being readied for 510(k) submission. The new products also provide improved patient safety, minimally invasive visualization of the heart, and access to the inside and outside of the heart, serving a variety of interventional procedures.

EP Dynamics has contracts with sales organizations to sell products in the US and is working to complete a funding event that will provide inventory for a national product launch. EP Dynamics expects to have European CE Mark in Q2 of this year, and is reviewing distribution options outside the US.

Startup Company Profiles



Neven Karlovac, PhD

CEO, Holomic LLC www.holomic.com

Holomic LLC was formed in 2011 to commercialize advanced BioPhotonics technologies invented at the world-renowned research laboratory of Professor Aydogan Ozcan at UCLA (www.innovate.ee.ucla.edu). Among the many applications that have emerged from the lab is the cellphone-based Holomic Rapid Diagnostic Reader (HRDR). In Holomic's portfolio and launched in mid-2012, the HRDR is an economical handheld reader enabling more reliable lateral flow immunoassay tests, instant access to electronic health records, and real-time, wide-area diagnostic data collection. This is ideal for point-ofcare, telemedicine, and public health monitoring. Other technologies in development include portable, low cost, digital holographic microscopes, and fluorescent microscopes. Holomic is ISO 13485 certified and registered with the FDA as a Class I medical device manufacturer. The company was a finalist in the Katerva Award, Nokia Sensing X-Challenge, and SPIE PRISM Award. For more information contact ketaki@holomic.com.



Leo Petrossian, PhD

CEO, Neural Analytics www.neuralanalytics.com

Neural Analytics (NA) is developing a software technology that enables doctors to make quantitative diagnoses of mild and severe traumatic brain injuries (TBIs). NA's software analyzes the cerebral blood flow velocity (CBFV) as captured by transcranial Doppler ultrasound (TCD). The core of the software is a patented, data-driven algorithm that accurately quantifies the waveform morphology. The derived morphological metrics drive the machine-learning framework, which comprises over 7 years of proprietary data collected in the neuro-intensive care unit at UCLA. The initial published results demonstrate a 92% accuracy in differentiating severe TBIs with elevated intracranial pressure.

NA's product will significantly improve patient care while reducing costs by employing the use of healthcare informatics.

- Inexpensive—Large cost savings relative to severe TBI tools: CT and intraventricular catheter.
- Accessible—Eliminates the need for a neurosurgeon, allowing a technician or trained paramedic to operate.
- Noninvasive—The tool will analyze data that is collected using existing, safe, medical ultrasound.
- Portable—The product is a small wearable headset.
- Accurate—Published clinical data from the UCLA Medical Center shows 92% accuracy in the diagnosis of severe TBI.

UCLA Medical Device Technologies Available for Licensing

CNS Technologies

Silicon Microsystems for High-Throughput Analysis of Neural Circuit Activity

There is an increasing appreciation for mapping brain activity in the central nervous system, particularly as it pertains to disease and injury. Functional MRI (fMRI) and electroencephalography (EEG) techniques can provide coarse-grained pictures of neuronal activity in the brain; however, they are unable to provide information on rapidly changing activity of single neurons, which is key to unraveling how the brain codes information. As a result, our understanding of neuronal brain circuitry and its relationship to disease has been limited by the resolution of current technology.

UCLA researchers in the Department of Neurobiology have developed a unique electrode array capable of simultaneously mapping neural activity from two or more brain structures. This technology addresses major technical obstacles of recording single neuron activity and expands on the potential of neuronal monitoring by allowing single-cell-resolution measurements of activity from numerous networked brain structures. In addition to enhanced recording performance, these new electrode array-probes will be more cost-effective to manufacture, as well as smaller, and hence less invasive.

LEAD INVENTOR: Sotiris Masmanidis, PhD UCLA Case No. 2013-039 Patent Status: Pending

Quantitative EEG Method to Identify Individuals at Risk for Adverse Antidepressant Effects

Antidepressant medication has demonstrated efficacy for the symptoms of depression, and overall antidepressant treatment is associated with improved mood and decreased suicidality. Some individuals, however, may experience adverse effects on mood during antidepressant treatment. There is some evidence that antidepressant medications are associated with increases in suicidal ideation and elevated risk for self-harm in a small subset of depressed individuals. Others develop significant anxiety, agitation, or other side effects that may lead them to discontinue medication prematurely. There is currently no physiologic or other clinical means of determining a patient's risk of such adverse medication effects. As such, patients and prescribing doctors face uncertainty in how to best heed warning of these potential risks of antidepressant treatment. It would thus be desirable to develop a method that identifies those patients who may be most vulnerable to adverse effects of medication, thereby increasing the margin of safety in antidepressant treatment.

Researchers at UCLA have developed a method that identifies patients likely to experience adverse effects from antidepressant medication. The patients' response to the treatment is measured by using quantitative electroencephalographic recordings (QEEG). This method has been validated in a small double-blind placebo-controlled clinical trial with 97% accuracy. Patient response to medication was corroborated by using standard clinical checklists that diagnose adverse symptoms.

LEAD INVENTOR: Aimee Hunter, PhD UCLA Case No. 2006-262 Patent Status: U.S. Patent Issued – #8,521,270

Novel Neuromodulation Devices for Chronic Pain, Sleep-Related Respiratory and Blood Pressure Disorders

The Center for Disease Control (CDC) estimates that about 70 million individuals in the U.S. suffer from chronic sleep loss and sleep disorders. Numerous health problems have been associated with sleep loss, such as obesity, depression, cognitive impairments, and cardiovascular risk. Specifically, obstructive sleep apnea (OSA) is the most common form of sleepdisordered breathing. Continuous positive airway pressure devices are a major and growing segment of OSA treatments, but have extremely poor patient compliance rates and significant side effects, including facial bone distortion. Globally, the sleep apnea devices market reached \$7 billion in 2010, and both the global and U.S. markets are expected to grow rapidly (~8% CAGR) through 2017.

Migraine and chronic migraine headache have estimated market sizes of \$4 billion and \$5 billion, respectively. Approximately 18% of American women and 6% of men suffer from migraine, and the migraine drug market is estimated at \$3 billion. Pain management devices have been a growing segment (4.3% CAGR) of the greater pain management sector (\$35.4 billion).

Dr. Ron Harper, a Distinguished Professor of Neurobiology at UCLA, and colleagues have developed novel neuromodulation devices and methods for treating chronic migraine pain, obstructive sleep apnea, and other cardiovascular and respiratory disorders. The technology developed by Dr. Harper's team employs non-invasive, non-pharmacological stimulation of specific neural pathways involved in each condition. The devices have been prototyped and are portable and customizable to a patient's anatomy. The devices have also been designed to allow control and data integration with personal wireless devices. Dr. Harper's group has initiated studies in human patients and established preliminary efficacy for the conditions of chronic migraine pain and sleep disruption.

LEAD INVENTOR: Ron Harper, PhD UCLA Case No. 2014-299 Patent Status: Pending

Diagnostic Tools

A Device for *In Vivo* Characterization of Body Fluids

The rheological properties of certain fluid reservoirs in the body, such as the vitreous humor of the eye, hold clinical value for monitoring a variety of disorders as well as evaluating effects of therapeutic treatments. However, no devices currently exist to rapidly assess fluid properties in humans *in vivo*.

Dr. Pirouz Kavehpour, Professor in the Department of Mechanical & Aerospace Engineering at UCLA, and colleagues have developed a needle-like probe to directly quantify the rheological properties of human body fluid in real-time. Dr. Kavehpour's work has demonstrated that the physical properties of human body fluid can be informative to determining macromolecular structure and organization within an organ, and that this information may be useful for detecting and monitoring disease. This probe has the advantages of being minimally-invasive and being able to measure fluid properties in vivo, obviating the need for fluid extraction. Thus, this device can be used to diagnose the risk, or the presence, of a degenerative or pathologic state through measurement of body fluid.

LEAD INVENTOR: Hossein Priouz Kavehpour, PhD

UCLA Case No. 2011-208 Patent Status: Pending

A Rectal Mucosa Sampling Tool

Obtaining a sample of the rectal mucosa is key to millions of diagnostic procedures performed each year, including those for colorectal and cervical cancer. Such sampling is also needed for detailed microbial, proteomic, and metabolic analyses integral to clinical research. Current procedures for sample collection, like biopsy and endoscopic lavage, entail the use of bulky anoscopes and rectal tubes, respectively. For a more comfortable alternative, some physicians have resorted to adapting ophthalmic "eve spears" to sample rectal mucosa. Although these modified tools are less bulky, they were originally designed for the eye, requiring improvisational procedures

to implement. Thus, there is a need for a better, more streamlined sampling device designed specifically for the rectum.

Physician-scientists at the UCLA David Geffen School of Medicine have developed an improved device for sampling the rectal mucosa. The device design eliminates the need to completely insert the tube into the rectum. This substantially reduces the discomfort associated with the procedure. In addition, other novel design implements make the tool more efficient, more precise, and safer for the patient.

LEAD INVENTOR: Jonathan Braun, MD, PhD UCLA Case No. 2012-535 Patent Status: Pending

Microfluidic Platform to Control Particle Placement and Spacing in Channel Flow

Researchers from the Department of Bioengineering at UCLA have developed a microfluidic platform that controls particlewall and particle-particle interactions by intertial flow. This permits fine manipulation of inter-particle spacing during solution exchange. This microfluidic platform utilizes expansion and contraction channel geometries to make particle distribution more uniform in Reynolds number flow. Moreover, particle-particle spacing can be tuned to a desired frequency. Unlike existing particle manipulation methods, particle manipulation by inertial flow enables extremely high-throughput without bulky external control units. The device fabrication is simple and easy, requiring PDMS molding and bonding only. With further development, it could be used as a platform for a generation of high-throughput flow cytometers.

LEAD INVENTOR: Dino Di Carlo, PhD UCLA Case No. 2011-038 Patent Status: Pending – Pub No. 20130233420

Sheathless Inertial Cell Ordering Microfluidic Device for Extreme Throughput Flow Cytometry

Flow cytometry is regularly used for patient blood analysis. However, because flow cytometry analyzes cells in a serial process, it is time-consuming and lacks sufficient throughput (current methods top out at 10,000 cells/sec) to detect rare cells in blood which can have concentrations in the range of one in one quadrillion (1:10¹⁵). In addition, flow cytometry has high operating costs, lacks portability, and requires dedicated personnel and is therefore impractical for point-of-care use. Because the global flow cytometry market is projected to exceed \$1.5 billion with an annual growth above 10%, great attention is being paid to microfluidic devices for healthcare applications. Microfluidics devices offer a significant reduction in cost, increase in portability, and higher throughput efficiency than flow-cytometry, with comparable or better sensitivity.

UCLA researchers have developed a microfluidic chip capable of processing ~28 million cells per second. The design does not require a sheath stream, which simplifies the design without sacrific-ing efficiency. By coupling the chip with high-speed imaging, the researchers can observe single cells to compare physical characteristics or specifically targeted/ stained cells for accurate blood cell detection and analysis.

LEAD INVENTOR: Dino Di Carlo, PhD UCLA Case No. 2010-277 Patent Status: Pending – Allowance Received – Pub. No. 20120063664

Automated Evaluation of Gastrointestinal Symptoms

Gastrointestinal (GI) diseases include illnesses involving the esophagus, stomach, small intestine. large intestine, rectum. liver, gallbladder, and pancreas, among others. Collectively, these affect 60 to 70 million people worldwide, and U.S. spending on GI diseases has been estimated at \$142 billion. Despite this burden on both the individual and on general healthcare, there have been few efforts to develop evidence-based tools to assist clinicians in diagnosing, educating, and managing GI patients within the context of everyday practice. For the most part, GI clinical practices currently operate without standardized symptom assessment procedures, lack formal educational libraries, and lack a reliable method to link up-front patient reporting with "back-end" educational prescriptions.

Researchers at UCLA have developed and validated a platform called the Automated **Evaluation of GastroIntestinal Systems** (AEGIS) to assist clinicians in treating GI patients. AEGIS includes a GI review of systems questionnaire that is administered through electronic portals (including personal computers and tablet devices) to collect, categorize, and interpret GI symptoms in a uniform and clinically-useful manner. Patients complete the electronic questionnaire either at home or on an electronic device in the waiting room to generate a standardized, integrated symptom output that will be available either in paper or integrated with electronic medical records. With this platform, years of accumulated academic data can be translated into clinically-relevant and actionable system reports for clinicians.

LEAD INVENTOR: Brennan Spiegel, MD UCLA Case No. 2012-600 Patent Status: Pending

Multi-Modal Depth-Resolved Tissue Status Monitor

Optical diagnostics are increasingly favored in clinical settings, because it can quickly and non-invasively provide information on physiologically relevant tissue content. It is widely used in pulse oximetry, functional near-infrared spectroscopy (NIR) for measuring neuronal activity, monitoring oxygen consumption in skeletal muscles, and measuring tissue blood perfusion.

Researchers at UCLA have developed a portable tissue status monitor that sits on the surface of the skin and can provide depth-resolved information about tissue health status, which is of paramount importance where tissue is very thin or consists of multiple layers. The monitor uses a variety of sensors to perform not only NIR, but also ultrasound, pressure, temperature and stretch sensing. In providing depth-resolved physiologic information, the technology may be used to monitor tissue after vascular surgery, during prolonged surgeries, or after mastectomy. In addition, the device can fit easily under surgical dressings or casts, and operates wirelessly, making it rather simple to use.

LEAD INVENTOR: Warren Grundfest, MD UCLA Case No. 2013-527 Patent Status: Pending

Single-Molecular Homogenous Amplified Detection in Confined Volumes

Enzyme-linked immunosorbent assays (ELISA) are widely used tools for analytical research in molecular biology research labs and in clinical diagnostics. This technique uses antibodies adsorbed on a surface to capture antigens and a secondary antibody to provide a detection signal. Existing assays require the detection antibodies to be immobilized to a surface.

Researchers at UCLA have devised a method to detect analytes using a modified sandwich ELISA that does not require immobilization on a surface or a solid phase. Using fractioned volumes, detection signals can be measured as a binary cutoff signal, leading to higher sensitivity. Additionally, this assay does not require a number of wash steps or sequential addition of reagents. It only requires one mix step and subsequent compartmentalization. This method can be used as a clinical diagnostic tool, including point of care devices, and for analytical research.

LEAD INVENTOR: Dino Di Carlo, PhD UCLA Case No. 2014-180 Patent Status: Pending

A Quick-Connect Multimaterial 3D Printed Microfluidic Platform with Integrated Package

Current techniques in microfluidics rely on soft lithography and a versatile polymer called polydimethylsilicone (PDMS). This technique requires photolithography to define channels and requires the need for cleanroom access. Multi-height and crisscrossing devices are a challenge because they often require more than one exposure as well as alignment of the previous layer. Commercial devices, often made of plastic, require hot embossing, injection molding, or compression molding, but these techniques can be expensive.

Researchers at UCLA have developed a quick-connect microfluidic technology that allows the end user to design a packaged device for various microfluidic applications using multi-material 3D printing to form the package, ports, and channels. The 3D-printed chip sandwiches a glass slide that can be functionalized. The number. size, and position of the ports as well as the hydrophobicity, cell lines, and special coatings can be tailored to the needs of the end-user. Additionally, this approach has faster turn-around times with no need for cleanroom access, messy PDMS processing, or manual insertion of inlets and outlets.

LEAD INVENTOR: Dino Di Carlo, PhD UCLA Case No. 2013-748 Patent Status: Pending

Accurate and Rapid Micromixer for Integrated Microfluidic Devices

UCLA researchers have designed and created a novel mixer for microfluidic devices that combines the advantage of rapid mixing times of droplet-based mixers (typically found in continuous flow devices) with precision and accuracy for controlling mixing volumes and ratios. The chip consists of three components: a digital droplet generator, a droplet mixer, and a gas extractor. It has been designed to easily integrate into digital microfluidic chips (i.e. chips that use valves to control fluid flow), as well as automated systems for a variety of applications.

The researchers have created a detailed design and fabricated a working prototype.

They have demonstrated the desired operation with their fabricated microfluidic chips and are devising fluorescence imaging to quantify parameters related to mixing. The inventors have also designed and are testing a new generation of the mixer to improve the initial design as well as further optimizing the chip, for the best dimensions, droplet generation cycle times, and flow rates. The researchers have also built an interface between the mixing chip and a semi-automated chemical synthesis unit to synthesize a radioactive labeling probe and immediately label a biological molecule of interest.

LEAD INVENTOR: Michael van Dam, PhD UCLA Case No. 2008-249 Patent Status: Pending – Pub. No. 20110103176

Microfluidic and Solid-State Beta Camera *In Vitro Radioassay*

There is a broad interest in targeting kinases for drug discovery and patient diagnosis. For example, kinases are important biomarkers in cancer diagnostics and treatment, and their activity can be monitored to determine the state of a cell (e.g. via PET imaging). This interest led to the development of numerous kinase assay technologies. Generally, radiometric assays are adopted as the primary technology used by companies that provide kinase profiling services. However, they suffer from several limitations. The input amounts required for these assays make it difficult to study kinase activity on a small level. Also, these assays are laborintensive, expensive, and are potentially hazardous to those handling the radioactive materials. Further, regulations that control the levels of a specific radioisotope that can be used may limit the desired work pace.

UCLA researchers have developed a polydimethylsiloxane microfluidic platform with a solid-state beta camera to measure kinase activity on a limited amount of patient samples. Miniaturizing the radiometric kinase assay brings several advantages over current radiometric assays. The amount of cell input required is reduced by 1,000 times over conventional assays. This allows for direct experimentation on clinical samples that are expensive or perishable. Also, the amount of radioactivity is reduced by at least one order of magnitude, alleviating radiation safety concerns. Further, the chips are inexpensive to custom design and produce. Finally, since most of the steps in the assay are under digital control, the performances of these assays are more efficient, faster, and less labor-intensive.

LEAD INVENTOR: Thomas Graeber, PhD

UCLA Case No. 2011-129 Patent Status: Pending – Pub. No. 20130244257

Point-of-Care Detection of Nucleic Acids

DNA testing for infectious diseases at the point-of-care is beginning to enter clinical practice in both developed and developing countries. They are especially useful for applications that require fast turnaround times, and in settings where a centralized laboratory approach faces limitations. The time and expense associated with transporting samples and purchasing large instruments for testing create a market need for methods that can provide diagnoses in the clinic or even at the home of the patient. Major advances in point-of-care testing for infectious disease require breakthroughs in assays and devices designed to allow similar detection sensitivity to instrument-based PCR detection, but are low-cost and disposable

Dr. Bashir Tafti of UCLA's Department of Interventional Radiology has developed a method for rapid point-of-care detection of nucleic acids. The approach couples nucleic acid amplification with an enzyme-based chemical reaction that supports subsequent quantification with existing portable devices. The detection scheme precludes the use of fluorescence or chemi- or bio-luminescence, thereby improving the stability and accuracy of detection. The researchers have also adapted the methodology for detecting protein antigens without the need for luminescent or fluorescent tags.

LEAD INVENTOR: Bashir Tafti, MD UCLA Case No. 2012-731 Patent Status: Pending

Endovascular and Cerebrovascular Devices

Neuro-Endovascular Ultrasound Thrombolysis

Stroke is the most common life-threatening neurologic disease, and the leading cause of death in the United States after heart disease and cancer. Among the current U.S. population, some 11 million people have, or will have, brain aneurysms, which constitute the main cause of non-traumatic subarachnoid hemorrhage. If not treated immediately, stroke can cause permanent neurological impairments and death. The current method of re-establishing blood flow in the blocked arteries involves the use of either systemic or local intra-arterial fibrinolytic therapy. Although there are many reports of successful recanalizations, these methods are not ideal.

Researchers at UCLA have developed a new method of treating stroke using ultrasonic energy. There are several advantages of this method over conventional fibrinolytic therapy: (1) ultrasound can recanalize arteries much quicker that fibrinolytic therapy, (2) ultrasound does not cause bleeding complications, and (3) ultrasound can be more economical that fibrinolytic therapy in itself and in overall hospital costs.

LEAD INVENTOR: Cheng Ji, MD UCLA Case No. 1995-593 Patent Status: U.S. Patent Issued – #6,024,718

Method and Device for Treating Intracranial Vascular Aneurysms

Approximately 6-8 percent of all strokes results from non-traumatic subarachnoid hemorrhage, a condition where blood leaks from the cerebral vasculature into the subarachnoid space. About 8 percent of subarachnoid hemorrhages result from rupture of an intracranial aneurysm. Ruptured intracranial aneurysms are associated with a high rate of mortality. Approximately 15% of the patients die soon after the initial rupture. An additional 20 to 30% of the patients die during the first 2 weeks following the initial rupture. Rebleeding is one of the major causes of death in the patients who survive the initial hemorrhage. In addition to the high mortality rate associated with ruptured intracranial aneurysms, there is also a high morbidity rate among patients who survive the rupture long term. Almost two-thirds of patients well enough to be discharged after surgical obliteration of the aneurysm have a residual neurological deficit.

Inventors at UCLA have developed a device, and a method, for the therapeutic management of intracranial vascular aneurysms. This technology involves the use of intravascular catheters that can directly image the aneurysm, and can occlude the entire lumen of the aneurysm sac using liquid sealing agents. The intracranial catheters are designed in various configurations so that they can be used to treat aneurysms, regardless of their neck size or location within the intracranial vascular system.

LEAD INVENTOR: Tarik Massoud, MD, PhD UCLA Case No. 1996-528

Patent Status: U.S. Patent Issued – #5,776,097

Self-Clearing Catheter Device for Surgically Implanted CSF Shunts

Hydrocephalus, a condition in which increased intracranial pressure is caused by the pooling of cerebrospinal fluid (CSF) in the brain, can be caused by outflow blockage, reabsorption, or overproduction of CSF. Elevated intracranial pressure can impact brain function, resulting in altered behavior and thought. The only treatment available for hydrocephalus is the surgical implantation of a shunt. The shunt-consisting of ventricular catheter, valve, and distal catheter-allows CSF to be redirected to other cavities in the body where the fluid could be reabsorbed. However, the shunt can be prone to complications; catheter obstruction due to gradual cell accumulation is one of the primary causes of malfunction. On average, 85% of people with shunts have at least two shuntrevision surgeries during their lifetime. A minority of patients struggle with recurrent shunt obstructions, requiring over 100 shunt revisions. Each surgery introduces additional risks of brain injury, as well as shunt infection. With over 25,000 shunt operations completed each year in the U.S. alone, a self-clearing catheter is of great relevance to extending the useful life of catheters and reducing the necessity for repeated invasive procedures.

The shunt system currently being developed at UCLA has a unique capability to clear cellular obstruction from its catheter flow holes. Rather than using surface layer coatings, the new approach uses micromechanical mechanisms to maintain the normal flow of the catheter. As the clearing mechanism is activated, the cellular obstruction is swept off of the catheter surface. Periodic activation of the mechanism would allow routine maintenance of CSF flow, which would prevent the formation of complete occlusion. The system can be operated by the patient, who will be able to perform the maintenance as part of their daily activities.

LEAD INVENTOR: Marvin Bergsneider, MD and Jack Judy, PhD

UCLA Case No. 2005-053 & 2010-175

Patent Status: Pending – Pub. Nos. 20080281250 and 20110313340

Dual Rotational Stent

Stents are small metal coils used to open up clogged arteries; they help prop the artery open and decrease the chance of it narrowing again. Currently available intracranial stent devices have been developed as an adjunctive technique for coil embolization. These stents are deployed across the neck of a cerebral aneurysm, and coils are placed inside the lumen of the aneurysms to prevent the protrusion or escape of these coils. However, all of these stents are designed with a low struts density to allow the placement of coils through them, resulting in difficulties preventing blood flow from getting into aneurysms.

Researchers at UCLA have invented a novel dual rotational stent device for the endovascular treatment of cerebral aneurysm without the need for placing coils in the aneurysm lumen. The adjustable and variable struts density pattern of the new stent device allows it to cover the orifice of the aneurysm. This is advantageous for causing blockage of blood flow to the occluding aneurysm, while sparing blood flow to perforators or side branches near the aneurysm neck. Specifically, the new compound stent has two main, but separate components: one for being positioned and stabilized in the parent vessel spanning the neck of aneurysm and the other one for controlling the degree of blood flow into the aneurysm.

LEAD INVENTOR: Dieter Enzmann, MD UCLA Case No. 2009-668 Patent Status: Pending

Brain Collateral Perfusion Augmentation by Cerebral Venous Pressure Modulation

UCLA researchers have developed a novel method and device to improve cerebral blood flow to about 50% of normal baseline value, thereby treating acute or chronic ischemia associated with stroke. The device and corresponding method use applied pressure to artificially achieve collateral circulation in the brain. The method and device both capitalize on a biological phenomenon where flow rate through a collapsible tube will depend only on an upstream pressure at the feeding segment, and will be independent of pressure downstream. To increase cerebral venous pressure and thereby redirect maldistributed blood flow, the device creates an occlusion of one or more veins coupled to the collapsed vessel. The device consists of an elongated tubular member with proximal and distal ends for insertion into a patient's superior vena cava (or other vein), an expandable occluder located at the distal end of the tubular member (the occluder has an expanded and a collapsed state), a device to measure pressure at the distal end of the tubular member, a device to measure cerebral blood flow in the patient. and a controller programmed to actuate the expandable occluder as a function of the measured venous pressure and the measured cerebral blood flow. This method and device are intended to treat patients suffering from blood flow diversion due to vessel collapse and rapidly restore CBF to about 50% of normal.

LEAD INVENTOR: David Liebeskind, MD UCLA Case No. 2009-224 Patent Status: Pending – Pub. No.

US 2010/0318114 A1

Self-Navigating Intracardiac/ Intravascular Catheter

Navigating catheters within the vascular system and the heart of a patient presents numerous challenges. While fluoroscopy is frequently used to localize catheters within the body, its performance is limited by the radiation exposure, space, and noise and blurring effects of the X-ray and acquisition system. Thus, catheter-based procedures —particularly those that require high precision, such as accessing the coronary sinus—are limited by fluoroscopy and technical operator skills as are other imaging modalities.

To address the challenges of catheter placement, Dr. Peyman Benharash of UCLA's Division of Cardiothoracic Surgery and colleagues have designed a selfnavigating catheter that contains sensors to determine its own position in the body. To date, the catheter design has been tailored to accessing the coronary sinus, a common site for interventional therapies. Sensors and other self-contained imaging modalities will provide inputs to either an operator or an automated system that will drive the catheter to the appropriate location. The catheter may be coupled to a robotic navigation system that advances the catheter at branch points in the vascular system and heart. This technology would provide easier access to the coronary sinus to implant pacemakers and do other complex intracardiac device interventions, which are rapidly increasing in number and type.

LEAD INVENTOR: Peyman Benharash, MD UCLA Case No. 2012-108 Patent Status: Pending

Novel Application of Laser Lithotripsy for Treating Vascular Calcification

In the United States, 12 million people suffer from symptomatic Peripheral Arterial Disease (PAD), wherein blood flow to the lower extremities is significantly reduced by atherosclerotic plaques. Traditionally, vascular bypass surgery has been considered the "gold standard" of treatment for PAD. However; not only is surgery associated with significant morbidity and mortality, but also 40% of these patients are not eligible for surgery. Percutaneous Transluminal Angioplasty (PTA) with or without stenting has been introduced as an alternative to surgical revascularization. Despite acceptable clinical outcomes; PTA is not flawless and suffers from major technical challenges. One of the most important limitations of PTA is Chronic Total Occlusion (CTO). Further, pulsed-wave excimer laser catheters have been developed to ablate fibrous plaques, yet they too have been challenged by low user visibility and incomplete clearance of debris.

To overcome these limitations, UCLA researchers have developed a special

endovascular catheter that can be used for laser-assisted angioplasty under direct visualization. This method also allows for irrigation and extraction of ablationinduced debris, thus reducing the risk of distal embolization. This method is based on holmium laser and provides a higher energy and repetition rate for smoother cutting and faster, more efficient tissue ablation. In fact, holmium laser systems have already been used for vaporization and complete ablation of heavily calcified urinary and biliary stones with great success rates. However, this laser had not been used for ablation of vascular chronic occlusions to date.

LEAD INVENTOR: Bashir Tafti, MD UCLA Case No. 2012-565 Patent Status: Pending

Novel Catheter for Precise Stent Delivery

Cerebrovascular disease (CVD) is the leading cause of death worldwide, claiming over 17 million lives each year. Current therapeutic strategies for the management of CVD include endovascular stents to expand a narrowed or blocked artery. The flexible nature of the stent that permits expansion and enables passage through tortuous blood vessels also imposes a technical challenge, known as foreshortening, to the accurate placement of the stent. Foreshortening describes the change in length of the stent as it elongates to fit the confines of the delivery catheter and shortens following its expansion within the target vessel - leaving the surgeon to estimate precise placement. Although radio-opaque catheter markings have been implemented to help ameliorate this ongoing challenge, their inadequacy has hindered its widespread use.

UCLA clinician Dr. Satoshi Tateshima in the Division of Interventional Neuroradiology has developed a novel catheter to help anticipate the degree of foreshortening during stent deployment. The present technology overcomes the inherent limitations of the widely used braided and laser cut stents – providing a superior device with increased placement accuracy and ease of use.

LEAD INVENTOR: Satoshi Tateshima, MD UCLA Case No. 2012-218 Patent Status: Pending

Coil-Assisted Retrograde Transvenous Obliteration (CARTO) Plug

Gastric varices (i.e. dilated submucosal blood vessels) are a common complication of portal hypertension in patients with cirrhosis and other liver diseases and are associated with serious morbidity (e.g. bleeding) and increased risk of mortality. An interventional technique called balloon-occluded retrograde transvenous obliteration (BRTO) has been shown to be effective in the management of gastric varices and is quickly gaining attention in the United States. However, due to long balloon indwelling time (4 - 48 hrs.), the balloon used in BRTO may become a nidus for complications such as increased risk of balloon rupture, access site complications, and infection. In addition, there are logistical challenges for hospitals, such as patient discomfort/inconvenience, ICU or higher level monitored bed requirement, and additional staff.

Some of these issues were resolved with a recently proposed modified-BRTO method wherein a vascular plug is used for occlusion of the efferent variceal veins. However, the vascular plugs have their own limitations, including (1) inability to create complete occlusion in large shunts with rapid blood flow, and (2) inability to plug expanding varices. In addition, the cylindrical shape of these plugs makes them mostly inflexible along the long axis and thus, the current vascular plugs cannot be advanced easily in tortuous vessels, which is usually the case in splanchnic varicose vessels.

UCLA researchers have introduced a new technique called coil-assisted retrograde transvenous obliteration (CARTO). In this approach, metallic coils are utilized for occlusion of the shunt. They have also developed a new device that can automatically adjust its size and diameter to the blood vessel and prevent dislodging of the deployed coils. Design features also include a central conduit that enables the infusion of complementary coagulative materials such as GelFoam®. With this new device, physicians can treat vascular varices that heretofore have been insufficiently occluded with currently available products.

LEAD INVENTOR: Edward W. Lee, MD PhD UCLA Case No. 2013-082 Patent Status: Pending

Imaging Devices and Software

Ultrasound-Guided Endoscopic Instrument

Hysteroscopically-guided procedures are becoming increasingly common in gynecologic practice. Among these operations are a number which, to a variable extent, are compromised by the inability of the surgeon to see deep into the area of dissection or resection. Included in this list of procedures are endometrial resections, adhesiolyses for Asherman's syndrome, and transcervical myomectomies for leimyomas with intramural components. In each of these procedures, the risk of perforating the uterus compromises the ability of the surgeon to adequately complete the procedure. Efforts to guide or monitor such procedures with concomitant laparoscopy have generally been expensive and unrewarding. The laparoscope may aid in the early diagnosis of perforation, but it is relatively useless in prevention.

Using endoluminal ultrasonic technologies with current resection techniques, researchers at UCLA have developed a new method to overcome many of the obstacles listed above. This novel technology may expand the types of procedures possible and enhance the quality of procedures performed under hysteroscopic guidance.

LEAD INVENTOR: Malcom Munro, MD UCLA Case No. 1994-528 Patent Status: U.S. Patent Issued – #5,957,849

A New Non-Invasive Technique to Record Human Cerebral Metabolites *In Vivo*

Magnetic Resonance Imaging (MRI) and Magnetic Resonance Spectroscopy (MRS) are anatomical and biochemical imaging techniques, respectively, which depend on the interaction of molecules with static and radio-frequency magnetic fields. MRI relies upon mapping the proton (1H) concentration of water molecules, while MRS records the ¹H concentration of several water-soluble metabolites. lipids and water. Although they use different techniques, MRS can be performed with the same MRI scanner by using identical hardware and slightly modified software platforms. Because MRS can also record metabolites consisting of other nuclei, such as carbon (¹³C), phosphorous (³¹P), fluorine (¹⁹F), and sodium (²³Na), it can be used to record the metabolite levels in different areas of the human body for which MRI provides the spatial coordinates for the volume locations. However, current versions of the localized one-dimensional (1D) MR spectroscopic sequences (STEAM, PRESS, ISIS, etc.) result in severe overlap of spectral peaks in the MR spectra and ambiguous assignments of metabolites.

UCLA scientists have developed a new version of the L-COSY sequence which uses only three radio-frequency (rf) pulses for localizing the voxel (CABINET sequence as an 1D analog) and recording the two-dimensional MR spectra (L-COSY: 2D analog). This added second dimension improves resolution, decreases the overlap of the peaks, and detects additional brain metabolite resonances close to the most dominant water peak. This technology has applications in the diagnosis and treatment of neurological disorders, and therapeutic evaluation of brain, breast, and prostate tumors.

LEAD INVENTOR: Albert Thomas, PhD UCLA Case No. 2000-331 Patent Status: U.S. Patent Issued – #7,200,430

Computer-Aided Detection of Implantable Man-Made Devices in Medical Images

Man-made devices are used more frequently, as medical implants to replace, support, or enhance biological structures in patients. The failure to monitor these implants accurately could threaten the life of patients, depending on the critical nature and position of the implantable devices. Unfortunately, there have been no techniques developed for detecting and classifying implanted man-made devices (IMDs) for medical imaging except for modeling surgical dental implants for simulation and planning purposes. Detection and surveillance of IMDs is required on a large number of images for within the same imaging modality and within different modalities. Currently, the presence and location of IMDs are assessed visually by a radiologist. It is a time-consuming and sometimes challenging task for physicians, and is therefore expensive for healthcare.

Researchers at UCLA have developed a computer-aided detection system (CAD) to detect and assess an IMD for medical imaging. The system is implemented as a computer software package. Following detection and classification of an IMD, the system can automatically generate a detailed report about the images. In detail, a report will include information for automatically determining: (a) location, (b) number, (c) category, manufacturer, and characteristics; (d) comparison to manufacturer's specifications; (e) movement between serial images; (f) safety verification and recall. This technology can detect a variety of IMDs such as pacemakers, pumps, stents, plates, coils, tubes, catheters, clips, nails, screws, and microchips. It is applicable to many medical imaging modalities, including X-ray, MR, ultrasound, nuclear, and optical.

LEAD INVENTOR: Dieter Enzmann, MD UCLA Case No. 2007-218

Patent Status: Pending, U.S. – Pub No. # W0/2012/106580

3D Transurethral Ultrasound System for Prostate Imaging

Focal therapy and needle-based procedures on the prostate are challenging due to the high potential for off-target side effects. These side effects, which include severe pain, incontinence, and impotence, could be mitigated by more accurate visualization of the boundaries of the prostate. While CT and MRI provide anatomical information of the prostate, they cannot readily provide real-time imaging information during a procedure.

Dr. Martin Culjat, Professor in UCLA's Department of Bioengineering, and colleagues have developed a transurethral catheter-based ultrasound system for imaging the prostate in real-time. The system offers the advantage of 3-dimensional imaging through electronic steering. This feature reduces motion errors in the image and allows reliable registration of the ultrasound image to CT and MRI scans of the patient. Real-time registered images would provide a highly accurate anatomical map of the prostate that could be exploited for prostate cancer therapy (brachytherapy, external beam radiation) as well as diagnostic biopsy (for lesion targeting with MRI).

LEAD INVENTOR: Shyam Natarajan, PhD UCLA Case No. 2012-068 Patent Status: Pending – Pub. No. 20130310679

Automated System for Scoring Changes in Quantitative Interstitial Lung Disease

Increasing evidence supports that the extent of interstitial lung disease is an important predictor of prognosis for idiopathic pulmonary fibrosis (IPF) and scleroderma. The median survival of IPF patients is 2-5 years. Visual, semi-quantitative scoring is the current standard to evaluating the stage of disease. However, semiquantitative scoring systems are limited by the requirement of expert radiologists and by inter-observer variation, so they tend to be unreliable for assessing changes in disease status.

Professor Hyun Kim and colleagues from UCLA's Department of Radiology have developed a new, fully-automated Computer Aided Diagnosis (CAD) scoring system that provides quantitative, repeatable, and retraceable measures of interstitial lung disease (ILD). The system provides increased sensitivity and consistency over visual scoring and can reliably estimate transitional changes in the levels of fibrotic reticulation, ground glass patterns, and normal, healthy patterns. These transitional scores of change are a sensitive metric for testing treatment efficacy in IPF and other disorders causing ILD. This technology has commercial application in monitoring patient disease and in clinical trial testing.

LEAD INVENTOR: Hyun Kim, PhD UCLA Case No. 2013-078 Patent Status: Pending

Improved Cardiac Imaging for Patients with Cardiac Devices

Late gadolinium enhancement (LGE) MRI is the clinical gold standard for in vivo myocardial tissue characterization, and is useful for assessing tissue viability in patients with ischemic heart disease, myocarditis, cardiomyopathies, as well as other heart conditions. LGE MRI is also playing an increasing role in guiding catheter ablation treatments for arrhythmia. Cardiac pacemakers and implantable cardioverter defibrillators (ICDs), which are often implanted into patients with such heart conditions, impair the utility of LGE MRI by producing disruptive imaging artifacts. These artifacts manifest as bright contrast signals, image distortions, or signal voids. Combined, these artifacts drastically limit a physician's ability to determine if scar tissue is present. Thus, novel methods or approaches are needed to clarify LGE MRI images for these at-risk patient populations.

Dr. Peng Hu in the Department of Radiological Sciences at UCLA's David Geffen School of Medicine has developed an approach to eliminate the image quality distortions associated with pacemakers and ICDs in LGE MRI. The technique has been tested in healthy volunteers and a number of patients having an implanted ICD. Given that over 500,000 patients are implanted with ICDs or pacemakers every year in the US, this technology significantly improves on the diagnostic potential of LGE MRI.

LEAD INVENTOR: Peng Hu, PhD UCLA Case No. 2013-310 Patent Status: Pending

Magnetic Resonance Imaging (MRI) Device for Improved High-Dose-Rate (HDR) Brachytherapy Treatment Planning

Internal radiation therapy (brachytherapy) involves the positioning of tiny radiationemitting sources within tumor tissue by using delivery devices such as catheters, needles, or other hollow conduits. The precise positioning of the radiation source is vital to delivering a high, therapeutic dose of radiation to tumor tissue, while simultaneously minimizing damage to surrounding normal tissue. CT imaging has been employed to visualize brachytherapy catheters, but it is not optimal in all imaging circumstances for visualizing tumors and certain normal adjacent organs. MRI is preferred by clinicians for imaging tumors, but it inadequately displays brachytherapy devices. Thus, a technology that could provide better visualization of both the tumor, normal tissue, and brachytherapy devices on MRI imaging would enable more accurate treatment planning and effectiveness of cancer therapy.

Dr. Daniel Ennis, Dr. Jeffrey Demanes, and colleagues in UCLA's Department of Radiological Sciences have developed a device that allows for the effective imaging of the radiation-delivering catheter and the surrounding tissue. Under MRI, the device can be detected with high contrast, thereby providing valuable positioning information of the treatment catheters relative to the tumor and normal tissue. The device will allow optimal positioning of the radiation source for the purpose of radiation therapy. This device has utility in visualizing catheter placement in the body where brachytherapy is the preferred treatment strategy and where catheters are used as brachytherapy conduits. This application includes, but is not limited to, prostate, breast, gynecological, sarcomas, head, neck, anal, and rectal cancers.

LEAD INVENTOR: Daniel Ennis, PhD UCLA Case No. 2012-546 Patent Status: Pending

A Novel Approach for Lower Energy Dynamic Cardiac Imaging with MRI

MRI scanning has conventionally been operated under low, static magnetic field strength (at or below 1.5 Tesla). For certain clinical applications, low-field MRI has been found to be suboptimal in providing an informative image due to the lower availability of signal. In turn, high-field MRI scanners-3 Tesla (3T) or greater-have been developed, and are providing the benefits of higher signalto-noise and contrast-to-noise ratios, as well as better spectral resolution. While high-field scanners have improved the diagnostic potential of MRI for numerous applications, including tumor detection and angiography, the high magnetic field does bring additional technological and safety limitations for other applications. In particular, cardiac CINE imaging-which is used to evaluate cardiac function, coronary arteries, and vascular anatomy and cannot be optimally resolved by 1.5T MRI-is limited by the high rate of energy absorption associated with 3T MRI. Increased energy absorption by tissues can lead to tissue heating and damage and is especially a concern for pediatric populations and patients with implanted devices. Previous MRI methods have been developed to address the safety concerns of high-field MRI, but not for cardiac CINE imaging. Thus, the development of new low-energy MRI techniques is necessary to reap the benefits of high-field MRI for cardiac indications.

Dr. Daniel Ennis and colleagues in UCLA's Department of Radiological Sciences have developed a novel MRI protocol that allows 2D and 3D cardiac CINE imaging with high-field MRI. The unique scheme maintains image contrast using 3T MRI while reducing the rate of tissue energy absorption by up to a factor of 3.5, thereby overcoming the safety concerns of tissue heating. Computer simulations and tests in humans have demonstrated that the new scheme can be used to produce high resolution images.

LEAD INVENTOR: Daniel Ennis, PhD UCLA Case No. 2013-038 Patent Status: Pending

Magnetic Resonance Microcoil

Increasing the field-strength of magnetic resonance imaging (MRI) scanners has been the main means of increasing sensitivity while improving spatial and temporal resolutions in obtained images. Clinics have traded 1-T systems for 1.5 T, with others upgrading to 3-T systems. Additionally, the improved signal-to-noise ratio (SNR) of smaller MRI coils can be leveraged to obtain better images using less field strength. Small coils on the order of tens of centimeters already exist for imaging the head, neck, spine, breasts, and extremities. Even smaller coils on the order of several millimeters have been attached to the tips of catheters for targeting tumors in the prostate, colon, female reproductive organs, esophagus, and blood vessels. Micro-scale images could enable high-precision localization of small tumors and tumor margins.

Researchers at UCLA have developed an MR microcoil with a high signal-to-noise ratio per-unit-volume enabling microscopic imaging and spectroscopy that is 100 times the resolution of a typical 3T MRI, and an SNR of 200 compared to 5 for a standard head matrix coil. Fine tuning of the windings as well as other innovations enable high performance. The device can be used in research, diagnosis, and treatment planning for diseases such as cancer and epilepsy. In addition, it can be used in the characterization of tissue engineering techniques as well as analysis of bone samples.

Lead Inventor: Debra Strick Rivera, PhD UCLA Case No. 2008-242 Patent Status: Pending – Pub. No. 20120182014

Orthopedic Devices

An Improved Cast for Bone Fracture Healing

The healing of a bone fracture often requires extended immobilization of the affected area. This immobilization is typically accomplished with the use of a cast, an approach that has not significantly changed for decades. However, traditional plaster casts are heavy, uncomfortable, and commonly cause skin irradiation and pressure point pain. Casts are also subject to molding and degradation by water and sweat. Such retention of moisture in casts can promote infection of a wound or surrounding skin. Thus, new devices that can support fracture healing while reducing water retention would greatly improve patient comfort and potentially mitigate losses of productivity and mobility during fracture healing.

Researchers from UCLA's Office of Intellectual Property, and from the Department of Bioengineering have developed an improved layered cast using lighter, synthetic materials that allow greater water permeability than existing casts. The new cast also allows for reversible hardening of the cast to allow for adjustments and removal of pressure points over the course of application. This new cast advances bone fracture treatment by improving the hygiene associated with cast-wearing, and by increasing patient comfort through its adjustability and enhanced mobility.

LEAD INVENTOR: Benjamin Wu, PhD UCLA Case No. 2012-755 Patent Status: Pending

A Novel Device for Quantifying Rotational Stability of the Knee

Rupture of the anterior cruciate ligament (ACL) is a common knee injury, resulting in 250,000 ACL reconstructions per year in the US alone. Contemporary management of ACL insufficiency involves replacing the injured ligament with a graft to restore both translational and rotational stability to the knee. The current standard for determining ACL reconstruction effectiveness, the Lachman test, only measures translational stability. For rotational stability, the pivot shift test is widely accepted, though an objective means of quantifying this is lacking. Current devices are large, fixed position constructs that are impractical for clinical use. Therefore, a tool to objectively and non-invasively quantify translational and rotational stability of the knee in the clinic is highly desirable.

Dr. Petrigliano and colleagues in UCLA's Department of Orthopaedic Surgery have developed a novel microelectromechanical system (MEMS) gyroscope with specific software architecture to quantitatively assess both rotational and linear stability of the knee. Non-invasively applied to a patient's lower extremity, it provides an objective measurement of the axial rotation of the tibia relative to the femur during the pivot shift exam. The maximum speed measurable using this device is 2000°/sec with a sample rate of 8000 Hz, and the footprint of the sensor is as small as 4 x 4 x 0.9 mm. This device has the potential to aid clinicians in non-invasively quantifying dynamic knee laxity following ACL reconstruction surgeries.

LEAD INVENTOR: Frank Petrigliano, MD UCLA Case No. 2012-519 Patent Status: Pending

Radiation Therapy and Oncology

A Breast Immobilization Device to Improve Radiation Therapy Dosimetry

Breast setup and immobilization is a difficult problem for external beam radiation therapy of breast cancers. A lack of setup reproducibility with breast tissue results in sub-optimal dosimetry and tissue toxicity in non-targeted, healthy tissues. Patients with larger or pendulous breasts, which are pulled down by gravity into close proximity of healthy organs, are especially prone to greater non-target toxicity and higher skin doses of radiation. Devices previously designed to support breast tissue and create space from the chest for safer radiotherapy have suffered from patient discomfort and skin build-up.

Dr. Ke Sheng, Associate Professor in UCLA's Department of Radiation Oncology, has developed a novel breast immobilization device that allows for more comfortable support as well as a robust radiation dosimetry improvement in breast tissue without the skin dose build-up effect that has plagued existing methods. The device is low-cost and modifiable for the desired breast morphology.

LEAD INVENTOR: Ke Sheng, PhD UCLA Case No. 2013-077 Patent Status: Pending

Sensors and Patient Monitoring Devices

Non-Invasive Optometric Medical Diagnostic Device

Biological tissues such as skin and arterial walls contain various endogenous fluorophores, such as NADH, collagen, elastin, and flavins, that are uniquely characterized by their fluorescence properties. These proteins can be markers of diseases, and cause the skin of diseased patients to fluoresce differently from that of healthy individuals. Consequently, fluorescence of the skin has been proposed as a means of diagnosing pathologic tissue.

UCLA researchers have created a fast. low-cost, and non-invasive approach for diagnosing various diseases. The technology takes advantage of the temporal response of endogenous fluorophores to a pulse of excitation light. A non-invasive optometric device is used to measure skin autofluorescence which depends on the health of the skin's patient. The optometric device can be used to diagnose any disease affecting the auto-fluorescence of the skin. Examples include hyper-pigmentation diagnosis of non-melanoma skin cancer, photo-aging caused by UV, and monitoring utriculus. It can also be used to determine the depth and size of a cancerous lesion and changes in skin morphology. The device could be used for-but is not limited to-monitoring diabetes, skinrelated disorders and cancer, acne, and photo-aging.

LEAD INVENTOR: Laurent Pilon, PhD UCLA Case No. 2004-657 Patent Status: U.S. Patent Issued – #7,904,140

Corneal Hydration Sensing with Thz Illumination

Proper corneal hydration levels are critical to maintaining optical vision. Currently, corneal hydration is measured using ultrasound optical pachymetry, which involves measuring the central corneal thickness and extrapolating the average water content from these measurements. However, mapping from thickness to hydration is very inaccurate, and is limited by inherent constraints. Another method uses confocal Raman spectroscopy to remotely measure corneal hydration. However, the excitation illumination influence necessary to achieve accurate measurements exceeds the ANSI regulations for use in humans by orders of magnitude.

Researchers at UCLA have developed an imaging system to detect corneal hydration levels by illuminating the cornea with low power, low energy, terahertz (THz) frequency light and measuring the magnitude of the reflected THz signal. The system is capable of resolving 0.18% changes in the water concentration of the cornea in vivo and results suggest a ~3x increase in dynamic range over ultrasound-based pachymetry. This system can be used for detecting inflammation, immune responses, edema, or other disease in the cornea.

LEAD INVENTOR: Martin Culjat, PhD UCLA Case No. 2012-100

Patent Status: Pending – Allowance Received - Pub. No. 20130162949

NMR Probe for Detection of Microstructures

Nuclear Magnetic Resonance (NMR) spectroscopy is a widely-utilized method for analyzing small molecule compositions. It is among the most sensitive techniques available, and has great potential for studying metabolic profiles in living organisms. Since variations in the metabolite concentrations are indicative of many disease states, NMR can be a powerful diagnostic tool. In practice, however, this requires sensitivity still beyond the capabilities of current instruments. As a result, using NMR for diagnostic purposes has been limited to academic research. A key component responsible for the sensitivity is the NMR probe, which holds the sample as it is inserted into the magnetic field. Advancing the probe design is critical to enabling practical medical applications of NMR.

UCLA researchers developed a NMR probe with sensitivity superior to current designs. It contains a novel noise reduction mechanism, making it the most sensitive probe of its kind. These properties allow the detection of metabolites at the single cell level. Additionally, the probe has a planar configuration, making it ideally suited for microfluidic chips used for diagnosis and prognosis. It is also made with an ultra small detection region, 0.08 mm length by 0.05 mm width by 0.05 mm high, for samples of small volume and low concentration (such as biological samples).

LEAD INVENTOR: Louis Bouchard, PhD UCLA Case No. 2012-550 Patent Status: Pending

Method to Non-Invasively Determine Respiration Rate Using Pressure Sensors

UCLA researchers in the Department of Electrical Engineering have developed a noninvasive method for measuring respiratory rate. Although not required, the system is intended to be used when the patient is sleeping. While the user is lying on top of the mattress embedded with pressure sensors, the system calculates and displays the breathing rate of the user, which can be used to identify irregular breathing patterns. Of particular note is that the system can detect episodes of apnea and subsequently alert a medical professional or caregiver. Moreover, all of the information is logged for later review. The graphical user interface developed as part of the invention provides several additional features.

The system is suitable for both home and clinical environments. At home, one can remotely monitor a patient's breathing patterns. Similarly, the system can be used in clinical environment, such as a sleep study center.

LEAD INVENTOR: Majid Sarrafzadeh, PhD UCLA Case No. 2013-009 Patent Status: Pending

Exercise-based Entertainment Controller

In 2010, more than one third of children and adolescents were overweight or obese. Moreover, childhood obesity has more than doubled in children, and tripled in adolescents over the past 30 years. Such an unhealthy state predisposes these individuals to a plethora of short and long-term health effects, including increased risk for diabetes, increased risk for various forms of cancer, poor cardiovascular health, and bone and joint problems.

To help combat this growing epidemic, UCLA researchers in the Department of Electrical Engineering have developed an exercise-based entertainment controller system. The system allows children to use entertainment appliances, such as the television or computer, based on the amount of physical activity they have done throughout the day, recorded via pedometer. When a child plugs the pedometer into their PC, the software retrieves data from the pedometer, and allots a time budget for the child to use entertainment appliances. When the time budget is exhausted, the power control module shuts off the corresponding appliance via an RF signal.

LEAD INVENTOR: Majid Sarrafzadeh, PhD UCLA Case No. 2009-496 Patent Status: Pending – Pub. No. 20130090213

Ultra-Violet Guardian (UVG): Real-time Ultra-violet Monitoring and Exposure Prediction

In the past 3 decades, there have been more instances of skin cancer than any other cancer combined. Non-melanoma skin cancers such as basal and squamous cell are the least severe, and make up 95% of all skin cancer occurrences. Melanoma is the most dangerous, and causes 75% of skin cancer related deaths. Skin cancer researchers project that 1 in 5 people will develop skin cancer during their lifetime.

UV Guardian (UVG) is a mobile application that helps establish fine grain UV exposure and skin cancer correlation. UVG protects the user from sun overexposure, while providing recommendations to enjoy sun light benefits, such as Vitamin D. We propose a technique for tracking and estimating the UV exposure of a pedestrian traveling along a path in a mapped urban environment. If the user keeps the phone in their pocket or purse, exposure is computed using an elaborate model that correlates travel path, environmental context and sample UV irradiance readings.

The major breakthrough of this method is the ability to create and maintain a digital history of the users' UV exposure from the time UVG is installed and activated on their smart phone. In the long term, UVG's ability to track fine grain UV exposure history will enable epidemiologists to obtain valuable data from skin cancer patients, and publish effective guidelines for skin cancer prevention.

LEAD INVENTOR: Jerrid E. Matthews, M.S. UCLA Case No.: 2011-740 Patent Status: Pending

Networked Sensor Systems for Remote Patient Monitoring

Sleep quality is a necessary and critical part of everyday health. Over 40 million people in the U.S. suffer from chronic sleep disorders, with sleep deprivation costing an estimated loss of \$18 billion annually, due to decreased productivity. Current methods to monitor sleep require patients to go to Sleep Monitor Centers with large electrophysiology, respiratory measurement, and motion measurement systems. This treatment plan is costly and there is a need to develop low cost, remote sleep monitoring systems.

UCLA researchers have developed an innovative Wearable-to-Enterprise Sleep Monitoring System to serve the market demand for Out of Center Sleep Testing (OCST) in adult patients. This technology combines monitoring, data archiving, reporting, usage assurance, and subject guidance. The system is comprised of wearable head, chest, and leg units. These units contain sensors for airflow, electroencephalography (EEG), electrooculography (EOG), electrocardiography (ECG), respiratory effort and rate, electromyogram (EMG), sleep time, motion, blood oxygen, auditory sensing, and actigraphy sensing measurements.

LEAD INVENTOR: William J. Kaiser, PhD UCLA Case No. 2013-008 Patent Status: Pending

A Novel Device for Treating Head & Neck Cancer

Head and neck squamous cell carcinoma (HNSCC) is the sixth most common cancer in the world, affecting more than 600,000 individuals annually worldwide. Surgical resection and chemoradiation therapy (CRT) are the dominant treatment modalities that often negatively impact patient quality of life. Unfortunately, even the most aggressive surgical resection and CRT often cannot remove all cancerous tissues due to proximity to numerous vital structures in the head and neck. The resultant low survival rates, with less than 50% of patients surviving beyond 5 years, motivate new approaches to improve elimination of malignant cells not targeted by CRT or surgery.

UCLA researchers have developed a novel implantable drug delivery device that reproducibly reduces tumor growth in vivo. The technology combines biocompatible polymer sheets with anti-tumor drugs and immune-boosting proteins that can be implanted to the surgical bed after debulking of the tumor. Importantly, the device adheres and conforms to the patient's complex tissue contours, thereby maximizing efficacy, safety, comfort, and limiting systemic side effects of pharmacological agents. These sheets are highly customizable, and can incorporate multiple drugs at different concentrations and release rates. Furthermore, the polymer sheets can be linked to immune-activating proteins like cytokines and chemokines that recruit important immune cells with potent anti-tumor responses, redirecting and restimulating the body to attack the malignant cancer cells. This device represents a new therapeutic modality for patients with HNSCC by maximizing the therapeutic index, minimizing systemic adverse effects, and enhancing postoperative radiation therapy.

LEAD INVENTOR: Benjamin Wu, DDS, PhD UCLA Case No. 2014-235 Patent Status: Pending

Surgical Tools and Device Materials

Improvement of Dental Resins: Decreased Toxicity and Improved Biocompatibility

Resin-based and resin-containing materials are routinely used in dental practices as direct filling materials, fissure sealing agents, and as bonding resins or resin cements for metal, porcelain, and resin inlays, veneers, crowns, and bridges. The use of resin-based materials will likely continue to increase in the future. While the use of resin-containing materials is beneficial to the appearance of patients, these materials carry the risks of cytotoxicity and allergy. Most dental bonding technologies use primers containing the hydrophilic resins HEMA or TEGDMA. HEMA and TEGDMA have been shown to be a cause of these adverse effects due to the release of unpolymerized monomers in the surrounding tooth area, thereby triggering apoptosis or programmed cell death. Similarly, the adverse effects of bleaching agents on dental pulp and gingivae are well established. Therefore, methods for neutralizing the harmful effects of resin monomers and bleaching agents would be beneficial to current dental practices.

UCLA investigators have discovered that the presence of a chemical inhibitor (CI) can inhibit HEMA- and TEGDMA-mediated apoptosis in numerous human cell lines. Not only was cell death inhibited, but the presence of the CI also led to an increased viability and function of HEMA and TEGDMA treated cells. This in vitro data has been confirmed with in vivo rat models, demonstrating that this CI can inhibit cell death induced by composites and bleaching systems, and restore function to dental pulp stromal cells. The results indicate that CI prevents adverse effects mediated by HEMA, TEGDMA and bleaching agents. This inhibitor may be incorporated into additive resin materials to mitigate their adverse effects.

LEAD INVENTOR: Anahid Jewett, PhD, MPH UCLA Case No. 2005-379

Patent Status: U.S. Patent Issued – #8,481,005

Surface Modification of Endovascular Devices

Current endovascular procedures for the treatment of vascular diseases use a number of metallic devices, including guidewires, stents, and coils. Popular materials for these metallic devices include nickel titanium (NiTi) or Cobalt Chromium (CoCr). Although these materials are commonly used, they have several limitations. First, the device generates friction during the installation procedure as the device rubs against the plastic catheter used during installation. A second problem is that once a metal device is placed in an artery, the patient needs to be on blood thinning medications for a long time. This problem can be mitigated by covering the device with native tissues and cells.

Researchers at UCLA have discovered a method of treating NiTi, "nitinol," sheets, wires, or stents, that overcomes the limitations of these devices in current practice. The devices are treated with a type of light, causing them to take on super hydrophilic properties. This conversion increases the affinity between the device and vascular tissue, resulting in the acceleration of the healing process and a reduction in clotting. The hydrophilic device also demonstrates less friction during insertion or delivery.

LEAD INVENTOR: Satoshi Tateshima, MD UCLA Case No. 2008-007 Patent Status: U.S. Patent Issued – #8,487,284

Robotic Micro-Surgery System

In recent years, robotic manipulators have proven beneficial in assisting surgeons in the performance of minimally invasive procedures with high precision and little tissue damage. Nonetheless, current robotic systems are not suitable for microsurgery procedures due to their limited range of motion, lack of tracking system, and bulky design. Furthermore, because microsurgery requires many instruments, the robotic systems need to be equipped with multiple integrated arms that are capable of maneuvering different surgical instruments.

Researchers at UCLA have developed a robotic system that performs complete micro-surgical procedures by exactly mimicking the motion of a joystick controlled by a surgeon. The system incorporates multiple arms, which can be moved separately or in unison. Each arm holds a surgical instrument that is moved in real-time, has high range of motion, and has access to a universal cartridge that facilitates connections for multiple utilities. The instrument precision is further refined by filtering and removing the natural tremor of the surgeon's hand. Additionally, because micro-surgery requires the instrument to mechanically maintain a fixed-point of rotation at the site of penetration, the system incorporates an integrated tracking system that allows the robot to compensate for patient movement. The tracking system also triggers automatic termination in the event that the patient moves beyond a determined threshold.

LEAD INVENTOR: Tsu-Chin Tsao, PhD UCLA Case No. 2009-300 Patent Status: Pending, US and Foreign – Publication #W0/2011/088400

Bioactive Endovascular Coils

About 5% of the population has some type of aneurysm in the brain. All cerebral aneurysms have the potential to rupture, causing serious complications including hemorrhagic stroke, permanent nerve damage, or death. The conventional treatment for brain aneurysms is microvascular clipping-a highly invasive, microsurgical procedure requiring craniotomy and long recovery periods. Over the past two decades, endovascular occlusion of intracranial aneurysms using Guglielmi detachable coil (GDC) technology has gained worldwide acceptance as a lessinvasive treatment alternative to standard microsurgical clipping. In this procedure, a catheter is inserted into an artery and a guide wire is used to release detachable coils made of platinum wire into the aneurysm to block it from circulation and cause the blood to clot. This method is minimally invasive, but its current limitations include a relatively high incidence of aneurysm recurrence and a reduced efficacy in treating large aneurysms. New approaches to improve detachable coil technology will be important for increasing the success rate of cerebral aneurysm treatment.

Researchers at UCLA have developed a detachable endovascular coil system with increased biological activity. These coil materials are inherently bioactive and can

be further coated with, or act as a delivery vehicle for, bioactive or therapeutic agents, such as drugs to control the inflammatory reaction inside the aneurysm. The innovation maintains the mechanical flexibility of the coils, ensuring that they are highly effective at preventing blood flow. These improvements will accelerate aneurysmal healing, and minimize their rate of recurrence.

LEAD INVENTOR: Benjamin Wu, DDS, PhD UCLA Case No. 2011-135 Patent Status: Pending

Lung Isolation System

Lung isolation and single lung ventilation are routinely instituted during thoracic surgery. Surgery involving the lung or the contents of the thorax often requires cessation of ventilation to one lung to either keep the lung immobile while surgery is performed, or to deflate the lung for better visualization of thoracic structures. One-lung ventilation is also utilized to isolate unilateral pulmonary bleeding or infection, as well as during the management of large pulmonary air leaks. The present gold standard for lung isolation, the double lumen endotracheal tube (DLT), is difficult to insert due to the device's size and design, requires exchange of the tube to a single lumen tube when post-operative intubation is required, and has limited compatibility with bronchoscopes and suction catheters, due to its small lumen diameters. Alternatives to the DLT, including balloon tipped endobronchial catheters ("bronchial blockers"), also have major drawbacks. Namely, one cannot quickly and easily alternate ventilation from one lung to the other, and the balloon could be dislodged preventing suction of the isolated lung.

Researchers at UCLA have invented a novel system that achieves reliable lung isolation using a standard large bore single lumen endotracheal tube, which maximizes compatibility with other devices. The system enables true dual lumen lung isolation/ventilation, thus enabling all the benefits of both a double lumen tube and a bronchial blocker without the downsides of either. It also incorporates a video visualization system, thus precluding the need for traditional fiberoptic bronchoscopy.

LEAD INVENTOR: Nir Hoftman, MD UCLA Case No. 2011-739 Patent Status: Pending

Expandable Mechanical Distension Device for Hollow Organ Growth

Short gut syndrome is a condition in which patients have insufficient length of intestine to maintain normal digestion and absorption. In the United States, over 100,000 patients suffer from the disease each year. Treatment options include feeding the patient intravenously, surgically altering the intestine, or transplanting the intestine. These therapies have limited success, and transplantation is limited to donor supply. Research within the past decade has suggested the possibility of treating short gut syndrome via intestinal lengthening devices.

Researchers at UCLA have developed a device to mechanically stretch out the intestine through the application of longitudinal force. The device is made of shape memory materials such as nickel-titanium or biocompatible polymers. During implantation, the device is collapsed to its minimum size, followed by deployment into the intestinal tract via a push rod. The structure then binds to a particular location, and slowly expands over a period of several weeks. In doing so, it applies longitudinal force, resulting in the lengthening of the intestine.

LEAD INVENTOR: Greg Carman, PhD UCLA Case No. 2009-227 Patent Status: Pending, US and Foreign – Pub No. #W0/2010/124126

Laser-based Bacterial Disruption for Treatment of Infected Wounds

Surgical wound infections are the second most common hospital-acquired infection, and can increase hospital length of stay by 10-14 days. Treatment of infected wounds costs more than a billion dollars in the US annually. Wound infections are difficult to treat because bacteria form biofilms that encase the bacteria. This barrier formed by the bacteria prevents white blood cells and antibiotics from entering and killing the bacteria. Current wound infection treatments include topical and systemic antibiotics, surgical wound debridement, wound dressings, chemical methods such as citric acid surfactants, and low intensity ultrasound. None of the above mentioned methods successfully destroys the bacterial biofilms.

Researchers at UCLA have developed a novel technology that uses laser-generated shockwaves to disrupt bacterial biofilms. Laser is applied to tissue coated with a thin metallic film. The metal absorbs the laser, exfoliates, and launches a mechanical stress wave (shockwave) through the tissue that disrupts the bacterial biofilms. A second wave is then generated through gel containing nano-encapsulated antibiotics and silver nanoparticles, and the antibiotic and silver nanoparticles are propelled into the tissue. Thus, this technology not only disrupts the bacterial biofilms, but also delivers antibiotics into the tissue.

LEAD INVENTOR: Warren Grundfest, MD UCLA Case No. 2009-230 Patent Status: Pending

A Video-Guided Chest Tube Insertion System

Dr. Robert Cameron, Professor of Clinical Cardiothoracic Surgery and Surgical Oncology in the Department of Surgery at UCLA, has designed a novel trocar system that supports real-time visual monitoring of chest tube placement. Thousands of chest tubes are placed annually into the pleural space of patients who have excessive air and/or fluid collapsing the lung. Currently, chest tube placement involves either an extremely painful "medieval" incision and clamp technique or a trocar/dilator system, both of which are "blind" procedures, often leading to poor tube position, organ damage, and even death. Dr. Cameron's device capitalizes on existing medical video technology to provide real-time monitoring and guidance of anatomical position of the chest tube during placement.

LEAD INVENTOR: Robert Cameron, MD UCLA Case No. 2012-287 Patent Status: Pending

Organ Resuscitation Solution & System for Enhanced Liver Transplantation

Liver organs suffer a tremendous degree of ischemia and reperfusion injury (IRI) during transplantation. The injury stems from the interruption of blood flow and depletion of nutrients to the organ in the period between donor organ procurement, preservation and transplantation into the recipient. Cell injury or death and metabolic changes accompany this cessation of blood flow and liver cells are further compromised upon revascularization of the organ in a process known as reperfusion injury. IRI is a significant problem and causes up to 12% of early organ failure and 15% to 25% of long-term graft dysfunction. Post-reperfusion syndrome has an incidence rate of up to 30% and can cause acute cardiovascular collapse leading to acute death of the patients. Moreover, IRI contributes to the ongoing crisis of transplantable organs because many potential organs from deceased donors are particularly susceptible to IRI. As such, these organs are discarded, since these organs would lack sufficient function when transplanted. Currently, there is no procedure or treatment to mitigate these effects.

Researchers in the Department of Surgery and UCLA Pfleger Liver Institute have developed a novel solution and system to minimize IRI associated with liver transplantation. The invention serves to replenish exhausted nutrients and resuscitate the organ before revascularization. In a swine model, use of the novel solution and system demonstrated enhanced liver function and improved survival compared to conventional approaches. This system may salvage livers, deemed to have incurred severe degree of ischemic injury and discarded, to transplantable organs. A solution and system to alleviate organ damage from IRI would have significant consequences on patient outcomes as well as the availability of transplantable organs. Over 2000 patients die annually in the United States while awaiting a liver transplant. Thus, increasing the number of available livers for organ transplantation could have huge benefit for the 16,000 patients awaiting a new liver. Moreover, this system could potentially be applied to other transplantable organs.

LEAD INVENTOR: Johnny Hong, MD UCLA Case No. 2012-292 Patent Status: Pending, US and Foreign

Bidirectional Hyperelastic Covers for Woven Stents

Medical stents are commonly used to repair or support damaged sections of blood vessels, and to treat atherosclerotic disease and aneurysms. Such stents are implanted in more than half of the patients with coronary artery conditions. However, current stent designs frequently result in hazardous wrinkling of the cover upon deployment, substantially increasing the risk of stent failure, and subsequent morbidity. A highly bi-elastic stent cover optimized to match the stent's distortion during deployment may significantly reduce the failure rate of such procedures as well as open opportunities to treat damaged/diseased vessels.

UCLA researchers have developed a novel hyperelastic thin film nitinol (HE-TFN) that can be used to cover medical stents. This porous film maintains a deformation ratio that matches the commercial stent distortion during deployment. As a result, potentially dangerous kinks and folds that arise from the crimping/expanding process are substantially avoided. This ensures the conformal stent delivery and deployment. Furthermore, the design strategy and the hyperelastic material allow customization of the cover to different deformation ratios, making the novel cover widely applicable to various types of commercial stents.

Lead Inventor: Greg Carman, PhD UCLA Case No. 2013-238 Patent Status: Pending

Notes:			

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