WORLD'S CLINICAL NEWS LEADER

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Acoustic Energy Fragments Painful Kidney Stones

A new study describes a next-generation lithotripsy device that uses cyclic pulses of ultrasound to fracture kidney stones at lower pressures than traditional shockwave technologies.

Developed at UC San Diego

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Suspended Animation Successfully Induced in Surgical Patient

For the first time, a patient cooled by induced hypothermia has been successfully revived, allowing surgeons more time to correct traumatic injuries.

The new technique, which was developed at the University of Maryland School of Medicine (Baltimore, USA; www.medschool.umaryland.edu), is called emergency preservation and resuscitation (EPR), and involves rapidly cooling a person suffering from acute trauma and cardiac arrest to around 10° to 15°C by replacing

Cont'd on page 5

Magnetic Blood Filtering System Draws out Disease

An innovative blood filtering system could draw out deadly infections such as malaria and sepsis from the body using magnets.

The MediSieve (London, United Kingdom; www.medisieve.com) filtering technology works in a similar way to dialysis. Blood is taken from a patient and infused with the MediSieve magnetic particles, which attach to

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Deep Learning Model Improves Screening of Chest X-Rays

With many millions of exams performed annually worldwide, chest X-rays are crucial for the detection of many diseases. Deep Learning (DL) models developed by researchers can now accurately screen and classify four key chest X-ray findings: pneumothorax, nodules and masses, fractures, and airspace opacities.

See article on page 4

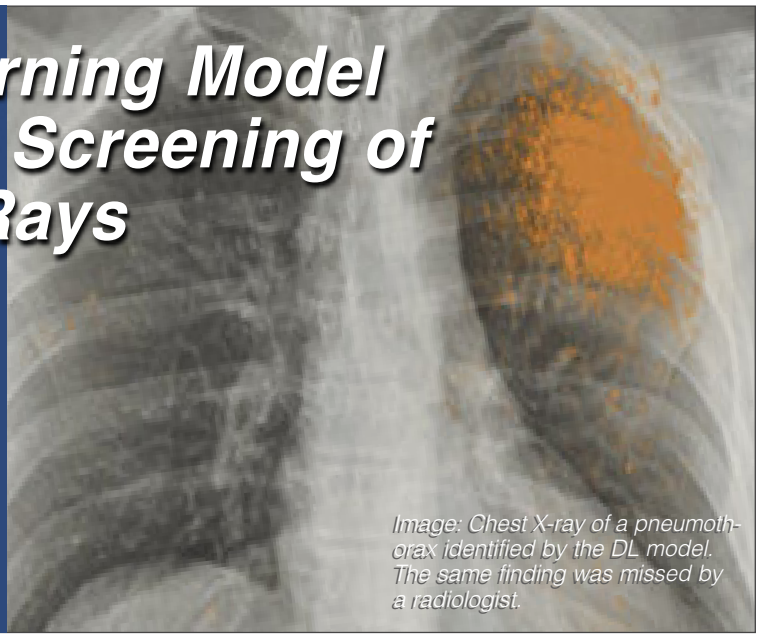

Image: Chest X-ray of a pneumothorax identified by the DL model. The same finding was missed by a radiologist.

Photo courtesy of Google Health

Antithrombogenic Additive Prevents Dialysis Blood Clotting

A new hemodialysis system uses surface-modifying macromolecules to prevent the formation of blood clots, obviating the use of blood thinners. Under development by Fresenius Medical Care North America (Fresenius; Waltham, MA, USA; https://fmcna.com), the new hemodialysis system will integrate the Evonik Healthcare

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Therapeutic Device Reduces Postoperative Oxygen Desaturations

Peripheral stimulation technology reduces postoperative hypoxemia (oxygen desaturation) in patients at-risk for obstructive sleep apnea (OSA).

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Non-Invasive Probe Quantifies Tissue Blood Flow Rate

A new sensor that clips onto fingers or toes provides an improved method of detecting and measuring treatment efficacy in peripheral artery disease (PAD).

The Laser Associated Sciences (LAS; Irvine, CA, USA; www.laserassociatedsciences.com) FlowMet-R includes a small laser diode and a camera the size of a postage stamp that combine to measure blood flow in a digit in real time; the measurement reflects the severity of PAD vascular disease upstream of the digit. The device

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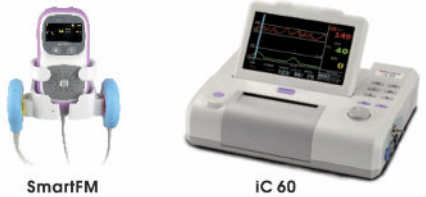
Fetal/ Maternal Monitoring



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Fetal/Maternal monitor series is able to provide safe, convenient and cost effective solutions according to the clinical needs from antepartum to postpartum monitoring, endipendently R&D modules and unique designs ensure the measurements more reliable and intuitive. Besides, Bicoare SmartFM is very unique and user-friendly which can be used in any places of hospital as long as wifi can cover, greatly improving the working efficiency of doctors and providing great convenience for end user.

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iP 21B iP 12B

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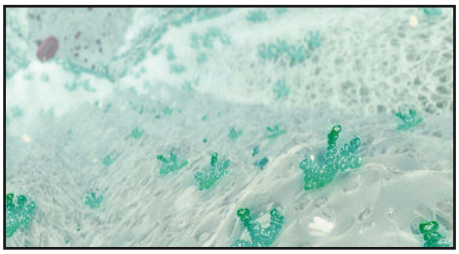
Antithrombogenic Additive Prevents Dialysis Blood Clotting

cont'd from cover

(Essen, Germany; https://healthcare.evonik.com) Endexo fluoro-oligomeric additive--an innovative polymer that inhibits adsorption of protein and platelets--into the manufacturing process of dialyzers and bloodlines. The low molecular weight, antithrombogenic additives migrate to the top few nanometers of the device surface during the manufacturing process, providing passive surface modification.

In the presence of blood, the modified surfaces are able to suppress procoagulant protein conformation, reduce platelet adhesion, reduce deep vein thrombosis (DVT) by 50%, and reduce tissue plasminogen activator (tPA) triggering in platelets by 59%. In the presence of bacteria mediated fluids, the modified surfaces are effective at reducing bacteria adhesion (up to 5 log CFU), encrustation, and biofouling. The Endexo platform technology can be applied to most base polymers (polyurethane, polysulfone, PVC, polypropylene, and silicone) and manufacturing techniques (such as extrusion, solution spinning, and injection molding).

"Many dialysis patients are currently prescribed blood thinners, like heparin, to reduce the risk of clotting as blood travels from their



body, through bloodlines, and into the dialyzers that filter out toxins," said Olaf Schermeier, CEO for global research and development at Fresenius. "Harnessing our innovational expertise, we continuously strive to make significant advances in our products and provide new solutions for people with chronic kidney disease worldwide."

Hemodialysis requires some form of anticoagulation, usually with heparin, to prevent thrombosis in the blood circuit. This consists of a dose of heparin given as a bolus at the start of the dialysis treatment, with a mid-treatment dose to maintain suitable anticoagulation. Alternatively, heparin modeling can be performed using an initial bolus, followed by a constant fixed infusion of heparin to maintain activated clotting time. Regional anticoagulation with citrate, prostacyclin, and heparin-protamine has also been used.

Deep Learning Model Improves Screening of Chest X-Rays

cont'd from cover

and other institutions have developed DL models that can accurately classify four clinically important chest X-ray findings - pneumothorax, nodules and masses, fractures, and airspace opacities. The target findings were selected in consultation with radiologists and clinical colleagues, so as to focus on conditions that are both critical for patient care, and for which chest X-ray images alone are an important and accessible first-line imaging study.

To do so, they used two large data sets. The first included 759,611 images from the Apollo Hospitals network (Hyderabad, India), and the second was drawn from a publicly available set of 112,120 images. Natural language processing and expert review of a small subset of images were then used to provide labels for 657,954 training images, with reference standards defined by four radiologists. The results showed that for all four radiologic findings, and across both datasets, DL models exhibited radiologist-level performance. The study was published on December 3, 2019, in *Radiology*.

"Achieving expert-level accuracy on average is just a part of the story. Even though overall accuracy for the DL models was consistently similar to that of radiologists for any given finding, performance for both varied

Image: Chest X-ray of a pneumothorax missed by radiologist (left), but identified by the DL model (right)

across datasets," said senior author Shravya Shetty, MSc, technical lead of Google Health. "This highlights the importance of validating deep learning tools on multiple, diverse datasets, and eventually across the patient populations and clinical settings in which any model is intended to be used."

With millions of diagnostic examinations performed annually worldwide, chest X-rays are an important and accessible clinical imaging tool for the detection of many diseases. However, their usefulness can be limited by challenges in interpretation, which requires rapid, thorough evaluation of a two-dimensional image depicting complex, three-dimensional (3D) organs and disease processes. As a result, early-stage lung cancers or pneumothoraces (collapsed lungs) can often be missed, potentially leading to serious adverse outcomes.

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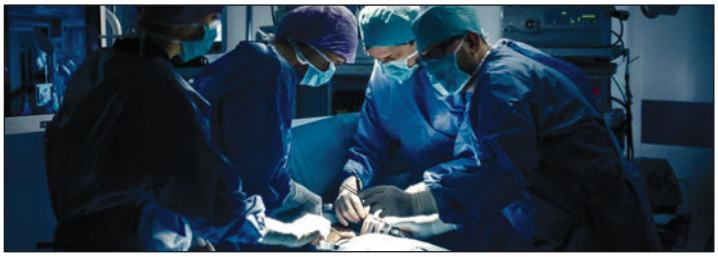
Suspended Animation Successfully Induced in Surgical Patient



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of their blood with ice-cold saline. As the patient's brain activity almost completely stops, they are then disconnected from the cooling system and their body, which would otherwise be classified as dead, is moved to the operating theatre.

The researchers reported they have successfully tried their process on one patient so far, and are now planning a trial with 10 people who will receive EPR, compared to 10 people who would have been eligible for EPR, but for the fact that the correct team wasn't in the hospital at the time of admittance. The study has been approved as participants are just minutes away from death, having lost half their blood and their heart has stopped. The plan of the study was outlined at the New York Academy of Sciences, with study results expected by December 2020. The report was published on November 20, 2019, in *New Scientist.*

"We felt it was time to take it to our patients. Now we are doing it and we are learning a lot as we move forward with the trial. Once we can prove it works here, we can expand the utility of this technique to help patients survive that otherwise would not," said principal investigator professor of surgery Samuel Tisherman, MD. Commenting on the concept of suspended animation, he said "I want to make clear that we're not trying to send people off to Saturn. We're trying to buy ourselves more time to save lives." Therapeutic cooling is among the most potent interventions for hypoxic-ischemic injury, a broad constellation of conditions ranging from cardiac and respiratory arrest to carbon monoxide (CO) and other poisonous gas exposure. It appears to limit tissue damage by reducing oxygen metabolism and inflammation, while maintaining cell membrane integrity.

Image: Inducing hypothermia can extend surgery time (Photo courtesy of Shutterstock)

cont'd from cover

is based on laser speckle imaging, with the source and detector on opposite sides of one another in order to produce reduced motion artifact and reduced laser exposure to the eyes, allowing safer intra-procedural monitoring during peripheral vascular surgery.

In tests conducted on patients before, during, and after vascular disruption induced via brachial artery occlusion, FlowMet-R system measurements were found to be significantly correlated with benchmark laser Doppler, with no significant differences in the mean flow value measured among people of all skin colors. The difference in mean transmitted intensity between light-skinned (White/Caucasian) patients and any other group demonstrated that skin tone did not significantly decrease light source throughput.

"The FlowMet-R technology provides much-needed insight into to the efficacy of revascularization surgeries in real time. By directly measuring limb perfusion during surgeries, physicians can see for the first time whether peripheral blood flow in being improved," said Sean White, CEO of LAS. "This reduces the ambiguity that clinicians currently face in knowing not only if an intervention is effective, but how effective it is. For that reason, the operating room is where we see the technology being adopted first, and we're really excited to see that." PAD results when the peripheral arteries become too narrow or obstructed due to plaque and limit the blood flow to the legs. If left untreated, PAD can cause pain or aching in the legs, difficulty with walking, resting pain in the foot at night in bed, non-healing sores or infections in the toes or feet, and can ultimately lead to limb loss in its most severe form.

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Therapeutic Device Reduces Postoperative Oxygen Desaturations

cont'd from cover

The MediPines (Orange County, CA, USA; www.medipines.com) Oxistimulator is a novel peripheral transcutaneous electrical stimulus (TES) device placed on the wrist that is designed to continuously monitor patient oxygenation levels and to reduce desaturations automatically when deemed necessary. Whenever threshold oxygen saturation (SpO_2) levels are lower than 93%, the Oxistimulator provides an immediate mild electrical stimulation, a therapeutic response that is just strong enough to reverse the deterioration, without harm or discomfort to the patient.

In a double-blind study conducted at the Mayo Clinic (Rochester, MN, USA; www.mayoclinic.org), 106 post-operative patients undergoing elective surgery who were at medium to high risk for OSA were randomized to either active stimulus (53 patients) with the Oxistimulator, or to an inactive placebo device (53 patients) at the post-anesthesia care unit. The results showed that the Oxistimulator group experienced a shorter duration of SpO_2 lower than 90% than the control group, with no adverse events reported. The study was published in the November 2019 issue of the *Canadian Journal of Anesthesia*.

"Oxistimulator represents a breakthrough in the way that it empowers clinicians to automate their clinical response; faster response means that patients spend less time in the hypoxemia danger zone," said Steve Lee, CEO of MediPines. "This is a novel solution to a serious clinical problem, and we are fortunate to be partnering with outstanding clinical partners to prove the clinical safety and efficacy as we bring this technology to market." Current pre-operative screening practices have been shown to miss nearly 50% of patients with OSA, who are at-risk for serious postoperative desaturation events that can lead to complications prolonging patient hospitalization, and in some cases, even death. Currently, the burden of catching and reducing hypoxemia after surgery falls on the clinical staff, such as nurses, who manually intervene when they see a desaturation; however, this manual process has been demonstrated to be sub-optimal.

Optical Guidance System Reduces Spinal Surgery Times

A new Machine-Vision Image Guided Surgery (MvIGS) navigation platform creates a near-instantaneous visual representation of the patient's anatomy, reducing operative times.

The 7D Surgical (Toronto, Canada; www.7dsurgical.com) surgical system is based on an invisible spatial pattern projected from an overhead surgical light onto exposed patient anatomy. While the pattern is itself is not discernable to the operating surgeon, it is detectable by the system; using three dimensional (3D) optical technologies and machine vision algorithms, a near-instantaneous rendering of the patient's anatomy is created, eliminating a long-standing barrier of widespread adoption of surgical navigational platforms.

Unlike conventional image guided surgery systems that depend on intraoperative radiation, the MvIGS platform can achieve incredibly fast (less than 20 seconds de novo spinal registration) acquisition and rendering of a highly accurate and detailed 3D surface. Once the surgeon defines the level of surgical interest, registration points are co-localized to the pre-operative CT. The MIGS navigation technology is embedded in an onboard overhead surgical light, which eliminates line of sight frustrations in the operating room, and is controlled by the surgeon using only a foot pedal.

"We have created an advanced imaging system using machine vision cameras. This in combination with our object registration algorithms allows our technology to automatically identify tissues or anatomical structures of interest very quickly and very accurately," said Beau Standish, CEO of 7D Surgical. "For example, the surgeon can visualize where the pedicle canals are below the top level of bone or through tissue. The surgeon then uses our optically tracked surgical tools, which are virtually overlaid on the patient's pre-operative data (CT, MRI) via a high definition monitor in the operating theatre."

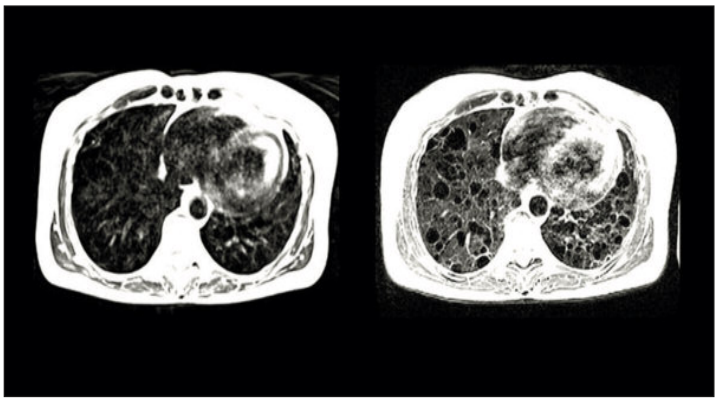
Innovative Low-Field MRI Improves Image Quality

A high-performance, low magnetic-field magnetic resonance imaging (MRI) system vastly improves image quality, making medical imaging more affordable and accessible for patients.

Researchers at the U.S. National Institutes of Health (NIH; Bethesda, MD, USA; www.nih.gov) and Siemens Healthcare (Siemens; Erlangen, Germany; www.healthcare.siemens.com) first modified a commercial MAGNETOM Aera 1.5T MRI system to operate at 0.55T, but maintaining high-performance hardware, shielded gradients (45 mT/m; 200 T/m/sec), and advanced imaging methods. Studies were then conducted to evaluate potential applications in MRI-guided cardiovascular catheterizations with metallic devices, diagnostic imaging in high-susceptibility regions, and efficient image acquisition strategies.

The researchers found that when comparing 0.55T images obtained to those obtained at 1.5T, lung cysts and surrounding tissues in patients with lymphangioleiomyomatosis (LAM) were seen more clearly. They also found that inhaled oxygen could increase the brightness of lung tissue more effectively when using the lower magnetic field strength, compared to the higher field strength, providing a unique view of the distribution of oxygen in the body. Similar advantages of low-field MRI were seen during catheterization procedures. The study was published on October 1, 2019, in *Radiology*.

"MRI of the lung is notoriously difficult and has been off-limits for years



because air causes distortion in MRI images," said lead author Adrienne Campbell-Washburn, PhD, of the NIH. "A low-field MRI system equipped with contemporary imaging technology allows us to see the lungs very clearly. Plus, we can use inhaled oxygen as a contrast agent. Imaging the upper airway with this system may also offer valuable clinical information for both sleep and speech disorders."

MRI scanners can have ultra-weak, weak, medium, strong, and super-strong magnetic fields. The highest-quality pictures are usually taken by using superconducting magnetic systems generating very strong magnetic fields, which traditionally provide the highest image resolution.

Image: Lung cysts are clearer using high-performance low field MRI (R) compared to standard MRI (L) (Photo courtesy of Adrienne Campbell-Washburn/ NIH).

Integrated Blood Collector Estimates Radiation Exposure

A new study describes how a compact blood self-collection device can quickly estimate exposure to radiation in the event of a nuclear accident or attack.

Developed at Columbia University (New York, NY, USA; www.columbia.edu), the University of Arizona College of Medicine (Phoenix, USA; https://phoenixmed.arizona.edu), and Georgetown University (Washington, DC, USA; https://www.georgetown.edu), the device is comprised of miniaturized vacuum tube coupled with integrated capillaries and a lancet that together form a self-collection device that can process blood specimens of 100 µl for analysis of the cytogenetic and gene expression biodosimetry responses of circulating lymphocytes. The analysis itself is undertaken in a centralized bioanalytical laboratory, with results returned after one day in the gene expression tests, and three days with the cytogenic tests. The miniaturized vacuum tube system facilitates liquid reagent storage, simple operation, and reduced sample contamination. The shelf life has been extended beyond one year by including low temperature storage, a Parylene barrier coating, and container vacuum bag sealing. Collected blood samples showed similar behavior in terms of gene expression and cytogenetic biodosimetry assays when compared to traditionally collected samples. According to the researchers, the new device could alleviate the sample collection bottleneck for radiation countermeasures following a large-scale nuclear event. The study was published on October 16, 2019, in *PLOS One.*

"Biological dosimetry determines the extent of damage to DNA caused by ionizing radiation associated with an acute exposure of a dirty bomb or nuclear accident. In ionizing radiation, electrons are knocked out of atoms and form charged particles," said lead author Jian Gu, PhD, of the University of Arizona. "In a nuclear event, hundreds of thousands of people would need to be screened in a very short time, and traditional medical infrastructure for blood collection may not be available."

There are two basic types of biodosimetry, with different, often complementary characteristics. The first is based on changes in biological parameters, such as gene activation or chromosomal abnormalities, while the second is based on physical tissue changes. Biodosimetry methods include chromosome aberration frequencies, as identified from fluorescence *in situ* hybridization (FISH) of peripheral blood lymphocytes, and electron paramagnetic resonance (EPR) measurements made on tooth enamel.

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The new improved Model 769 Doppler Flow Pump, is compatible with both its ATS Urethane flow phantoms as well as its new Model 069A Zerdine flow phantom and provides a complete solution for QA testing of Doppler ultrasound devices.

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Novel RF Table Improves Workflow and Operator Efficiencies

A multifunctional conventional radio/fluoroscopy (RF) table system easily performs both bariatric and routine daily fluoroscopic and radiographic exams.

The Shimadzu Medical Systems (SMS; Torrance, CA, USA; www.shimadzu-usa.com) FluoroSpeed X1 edition RF system offers imaging multimodalities, including not only general RF applications, such as chest, abdomen, or extremities imaging, but also upper gastrointestinal (GI) needs, such as modified swallows, and even joint injections. The system comes supplied with a 43X43 cm dynamic flat panel detector (FPD) pre-installed in the table bucky; an optional second X-ray tube installed on an overhead rail can expand system functionality and versatility exponentially.

The table can support a static weight bearing load of 300 kg, as well as a 227 kg all motion bearing load; and with an 80 cm aperture opening between table top and deck, it is wide enough to provide access for imaging patients in wheelchairs. Other features include Glide Assist technology, which allows the FPD deck to be parked in any position effortlessly; height adjustable patient-side table controls; fingertip access to automatically programmed radiography (APR) sets; image recording functions; ambidextrous control handle for the imaging deck; and site-specific programmable function buttons.

"The X1 is an outstanding RF system offering a cost-effective balance of functionality to support a wide range of general RF applications, such as chest, abdomen, or extremities along with Upper GI's," said Charles Cassudakis, director of radiographic and RF modalities at SMS. "An ambidextrous control handle for the imaging deck, along with fingertip access to APRs, image recording functions, and site-specific programmable function buttons, are all standard on the new X1 RF system."

Image: The FluoroSpeed X1 edition RF system (Photo courtesy of Shimadzu Medical Systems)

MicroRNA Ratios Differentiate Melanomas from Nevi

A new study shows how an optical discrimination platform can detect malignant characteristics in a melanocytic tumor using specific microRNA (miRNA) patterns.

Developed at the University of California, San Francisco (UCSF; USA; www.ucsf.edu), the University of Utah (Salt Lake City, USA; www.utah.edu), and other institutions, the new technique applies a machine learning-based pipeline to a dataset consisting of genetic features, clinical features, and next-generation microRNA sequencing to tissues samples, in order to distinguish melanomas and their adjacent benign precursor nevi. The ML technique can detect eight specific expression ratios of miRNA patterns in the micro-dissected sections.

For the study, the researchers examined 82 biopsy specimens of moles and malignant melanomas, 41 of each type, taken from the medical records of the UCSF dermatopathology section. They then compared the new optical method of detecting malignant melanoma cells with the actual recorded outcomes. The results revealed a sensitivity of 81% and specificity of 88%, which was uninfluenced by either the age of the patient or by the presence of a large amount of benign cells in the same tumor. The study was published on June 20, 2019, in the *Journal of Investigative Dermatology*.

"We found that by developing a classifier based on a ratio of diagnostically important miRNA we could provide a more robust biomarker that was less susceptible to changes in tumor cell content and platform," said lead author Rodrigo Torres, PhD, of UCSF. "The advantages of using miRNAs to distinguish benign and malignant melanocytic tumors include the fact that that they are easy to obtain from body fluids, are stable, inexpensive to measure and do not require very invasive techniques or a large amount of tissue."

A miRNA is a short stretch of non-coding RNA that act to stop the production of protein by the RNA as and when indicated, typically by binding to a part of the RNA which is not involved in protein encoding. The miRNA expression profile variations between tissues, the relationships between them, and genetic and clinical features can help to identify the tissue a tumor originates from.

Hyperspectral Imaging Detects Cancer During Surgery

A smart surgical microscope that examines cells at the ultraviolet (UV) and near-infrared (NIR) spectrum could help identify cancer cells in the operating room (OR).

Developed by researchers University of Texas (UT) Southwestern Medical Centre (UTS; Dallas, TX, USA; www.utsouthwestern.edu), the University of Texas at Dallas (UTD; Richardson, USA; www.utdallas.edu), and other institutions, the reflectance-based hyperspectral Imaging (HSI) and autofluorescence imaging microscope provides a non-ionizing optical imaging modality that can accurately detect and help reduce inadequate surgical margins during squamous cell carcinoma (SCC) within minutes, using deep learning and machine learning tools.

For the study, the researchers examined 102 excised tissue specimens. The tissue specimens were first imaged with reflectance-based HSI and autofluorescence imaging, and afterwards with two fluorescent dyes for comparison. The results showed that reflectance-based HSI and autofluorescence imaging could detect cancer at micrometer resolution, and outperformed both proflavin dye and standard red, green, and blue (RGB) images. Overall, HSU predicted the presence of cancer cells with

80-90% accuracy. The study was published on September 14, 2019, in the journal *Cancers*.

"We hope that this technology can help surgeons better detect cancer during surgery, reduce operating time, lower medical costs, and save lives. HSI is noninvasive, portable, and does not require radiation or a contrast agent," concluded senior author Baowei Fei, PhD, EngD, of the UTS department of radiology, and colleagues. "If we have a large database that knows what is normal tissue and what is cancerous tissue, then we can train our system to learn the features of the spectra. Once it's trained, the smart device can predict whether a new sample is a cancerous tissue or not."

HSI can help acquire large numbers of spectral bands throughout the electromagnetic spectrum (both within and beyond the visual range) with a very fine spatial resolution. So fine, in fact, that for every image pixel a full spectrum of color can be detected. Using this information and complex classification algorithms, it is possible to determine which material or substance is located in each pixel.

Image: Dr. Baowei Fei demonstrating HSI of tissue (Photo courtesy of UTD).

Acoustic Energy Fragments Painful Kidney Stones

cont'd from cover

Health (UCSDH; CA, USA; https://health.ucsd.edu), Break Wave is a novel investigational device designed to apply burst wave lithotripsy (BWL) on the skin, either over the kidney or over the ureter. Once positioned, the stone is located via real-time ultrasound image guidance and a low amplitude burst of sound waves is emitted to fragment the stones, typically composed of hardened calcium oxalate, calcium phosphate, uric acid, or magnesium-ammonium-phosphate. The procedure requires little to no anesthesia.

Pre-clinical studies with a range of probes, interfaces, and outputs demonstrated the feasibility and consistent safety of BWL, which was used painlessly and without adverse events to reposition stones in 14 of 15 human study participants without restrictions on patient size, stone size, or stone location. An international, multi-center non-randomized clinical trial of the Break Wave device will recruit up to 30 patients with stones of a diameter up to 20 millimeters, with the primary goal of evaluating the device and to determine if the procedure can be done with minimal or zero anesthesia and in a non-surgical environment.

"Think of an opera singer hitting the right vocal pitch to produce vibrations that stress and break a wine glass. This is a similar concept," said urologist Roger Sur, MD, director of the Comprehensive Kidney Stone Center at UCSDH. "The idea behind this investigational technology is to repeatedly stress certain points in the stone that cause it to fracture into small fragments, while avoiding damage to surrounding tissue."

"If this study shows that this technology is both safe and effective in fragmenting kidney stones and does so with little to no anesthesia, it could be a game changer for patients," concluded Dr. Sur, who performed the world's first clinical trial procedure. "While watchful waiting is a good approach for the majority of kidney stones, we are in need of more non-invasive technologies that can treat stones without harming other structures."

Kidney stones are often no larger than a grain of rice, yet some can grow to a diameter of several centimeters, causing blockage of the ureters. If it cannot be dissolved chemically, the kidney stone is treated using extracorporeal shock-wave therapy or minimally invasive endoscopic modalities. Many of these patients suffer from disease recurrence and need retreatment, but new stone formation might be reduced by adapting dietary habits or the use of particular medication strategies, as based on stone composition.

DEFIBRILLATOR
Cardioline

The elife700 manual biphasic monitor defibrillator features a built-in thermal printer for advanced monitoring and a wide screen that allows viewing of both the ECG signal and monitoring parameters.

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HANDHELD DOPPLER
Huntleigh Diagnostics

The Sonicaid Digital SR2/SR3 high sensitivity handheld Dopplers with fixed 2MHz or 3MHz are intended for general purpose screening of the fetal heart from as early as 8-10 weeks through to labor.

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RESPIRATORY HUMIDIFIER
INTERSURGICAL

The 7000 Series Respiratory Humidifier provides a further option for active humidification and offers one-touch mounting of a humidification chamber and auto modes with pre-set temperatures

LINKXPRESS.COM HMI-03-20 209

Hemodialysis System Assists Disaster Recovery Response

A novel hemodialysis device requires only an electrical outlet and tap water to operate, freeing patients in disaster areas from dependence on expensive infrastructure.

The Outset Medical (San Jose, CA, USA; www.outsetmedical.com) Tablo dialysis system is designed to work like a consumer-operated device, so that almost anyone can learn how to deliver dialysis, including the patients themselves. A large animated touch screen display makes the system easy to learn and use, intuitively leading the user through the dialysis process with the aid of guided animations. In addition, a proprietary suite of sensors--including an integrated blood pressure cuff--and data sets meld together machine and patient in order to automatically adjust treatment parameters, customizing therapy to the individual patient's needs.

The Tablo is primarily designed for self-care, and as such includes several unique features, including a filtration system that purifies regular water to produce dialysate in real-time; cartridges that snap into place easily, reducing setup and takedown time; automated saline bolus and tracking; one-touch rinse-back and automated self-cleaning; and a flexible treatment duration that starts at 30 minutes and up to 12 hours or even 24 hours with a supplies changeover. Tablo also provides two-way communication with the cloud to seamlessly transmit treatment data to a remote diagnostics platform that powers service and support.

"Emergencies such as hurricanes and floods can severely impede dialysis services, and put a vulnerable population at risk," said Leslie Trigg, CEO of Outset Medical. "Tablo's design enables fast deployment to the field using existing water sources in the disaster-affected community. Its simplicity accelerates training and set-up time."

Dialysate is a nonsterile aqueous electrolyte solution that is similar to the normal levels of electrolytes found in extracellular fluid, with the exception of the buffer bicarbonate and potassium. Dialysate solution is almost an isotonic solution, with the usual osmolality approximately 300 ± 20 milliosmoles per liter. To ensure patient safety and prevent red blood cell destruction by hemolysis or crenation, the osmolality of dialysate must be close to the osmolality of plasma.

Image: The Tablo hemodialysis system can be used anywhere (Photo courtesy of Outset Medical)

Magnetic Blood Filtering System Draws out Disease

cont'd from cover

specific targets so that they can be subsequently captured by a magnetic filter and removed from the blood before it is pumped back into the body. Particle size, magnetic properties, and number of binding agents coating the nanoparticles are all engineered to ensure maximal capture and removal by the filter. The whole process takes around two to four hours.

"In theory, you can go after almost anything. Poisons, pathogens, viruses, bacteria, anything that we can specifically bind to, we can remove. So, it's a very powerful potential tool," said George Frodsham, CEO and founder of MediSieve. "When someone has a tumor, you cut it out. Blood cancer is a tumor in the blood, so why not just take it out in the same way? Now we know it's possible; it's just a question of figuring out some of the details."

Blood can be repeatedly passed through the system until the target is at such a low concentration that the immune system or a short course of medication can remove it. The first disease due to be tested for device efficacy is malaria; interestingly, in this case, the first step is not necessary, as malaria targets iron-rich blood cells and consumes hemoglobin, turning it magnetic. Further trials will be conducted to see whether the nanoparticles can remove sepsis-causing bacteria and tone down the deadly immune response.

"Malaria treatment is our flagship product because the infected cells have naturally occurring magnetic properties. The malaria parasite invades the red blood cell and consumes the hemoglobin, and therefore it leaves an iron-based waste product, which it then takes inside itself. So effectively malaria parasites poop is magnetic, and then it eats its poop," explained Mr. Frodsham. "We really feel we can have a material human impact to help those suffering the most from the disease, particularly children and pregnant women."

Reusable ECG Patch Analyzes Human Vitals and Biometrics

A novel wearable electrocardiogram (ECG) patch combines multiple vitals and biometrics into a single platform for continuous patient monitoring.

Weighing just 7.5 grams, the VivaLNK (Campbell, CA, USA; www.vivalnk.com) Multi-Vital ECG Patch can generate a continuous stream of ECG rhythm, respiratory rate (RR), RR interval, heart rate, and three-axis accelerometer data for continuous patient and remote patient monitoring (RPM) applications. The patient-centric sensor, which comes in the form of a small bandage, is reusable, which can increase its economic value ten-fold or more, compared to single use devices. An associated Software Development Kit (SDK) enables application developers to build medical solutions, without needing to become experts in hardware and sensor networks.

Application of the patch include live streaming and offline recording of ECG traces; cardiac arrhythmia monitoring; chemotherapy remote patient monitoring; clinical trial remote patient monitoring; patient infection monitoring; hypertension stress management; and heart failure event detection. The SDK is part of the VivaLNK Medical Sensor Platform strategy, which accelerates medical application innovation by decoupling the sensor hardware, data capture in remote locations, and cloud connectivity from the application, so that healthcare solution developers can focus on the algorithms and analytics for their specific domain.

"Our aim is to accelerate medical application development by providing the sensor platform so that the industry can rapidly innovate novel solutions, while at the same time making it more accessible to patients around the world," said Jiang Li, CEO of VivaLNK. "VivaLNK's unique electronic skin technology offers powerful technical capabilities without compromising user experience."

As a result of increasing healthcare costs, an increasing aging population, and demonstrated improved patient outcomes with advanced RPM technologies, healthcare providers are beginning to shift eligible patients toward home care programs. Remote and continuous monitoring have shown a reduction in readmissions, improved patient outcomes, and overall decrease in cost of care compared to a traditional hospital stay.

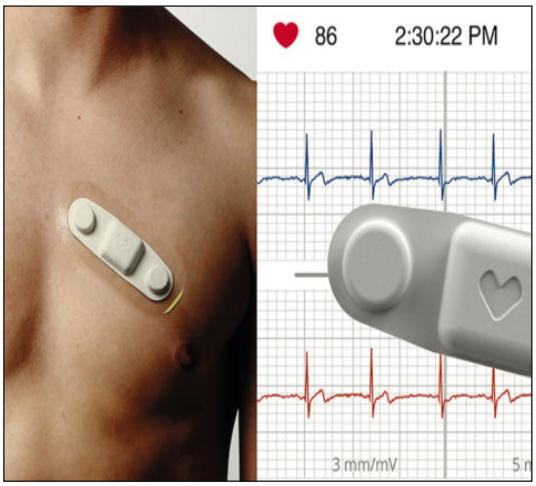

Image: A small patch help monitor patients vital signs remotely (Photo courtesy of VivaLNK)

PRODUCT NEWS

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BALLOON CATHETER
MedGyn

The Balloon Catheter is a disposable, multiple lumen catheter attached to an inflatable balloon system. It is designed to provide tamponade for controlling hemorrhage from the uterus and vagina.

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PATIENT MONTHOR
Bionet

The BM5 multi-parameter patient monitor offers individual sweep setting for each parameter. It features a 10.4-inch TFT color screen LCD monitor and stores 168 full hours trend data.

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INFUSION PUMP
Caesarea Medical Electronics

The BodyGuard 575 Color Vision infusion pump features a large multi-colored display with exceptional contrast and a piston mechanism that delivers ±5% accuracy and 1.8µl linear infusion.

LINKXPRESS.COM HMI-03-20 212

Glass-Coated Catheter Inserts Protect Against Nosocomial Infection

A phosphate glass compound containing small amounts of zinc oxide (ZnO) can help eradicate the urinary tract infections (UTIs) that plague catheter patients, according to a new study.

To develop the new catheter coating, researchers at Aston University (Birmingham, United Kingdom; www.aston.ac.uk) heated phosphate-based glass rods $(P_2O_5)50(Na_2O)20(CaO)30$ in a furnace to over 1,000°C, before slowly cooling them down to room temperature. The rods were then separated into small discs and placed into contact with bacteria in petri dishes. The rods were laced with ZnO in various concentrations order to determine the antimicrobial effects of increasing ionic degradation. They found that while 1 and 3 mol% ZnO decreased glass degradation, a higher dissolution rate was observed for 5 and 10 mol%.

They found that the higher the ZnO concentration, the larger the effect against microorganisms known to cause hospital-acquired infections (HAIs). When in direct contact, the ZnO-doped glasses showed a complete kill within 24 hours against *Escherichia coli*, and a significant kill rate of *methicillin-resistant Staphylococcus aureus* (MRSA), with complete kill achieved after 48 hours. Cytotoxic studies showed no toxic effects on the viability of uroepithelial cells. The study was published in the October 2019 issue of *Materials Science & Engineering C.*

"Zinc oxide coated phosphate glass, inserted into catheters, has to potential to eradicate the most common bacteria in catheter-associated UTI, *E.coli* and *Staphylococcus aureus*," said senior author Richard Martin, PhD, of the School of Engineering and Applied Science. "This is great news for patients requiring catheters, who would be at a much-reduced risk of contracting a potentially life-threatening UTI during a hospital stay. It is also good for healthcare systems, which could save millions in the costs associated with these infections."

A UTI is an infection involving any part of the urinary system, including urethra, bladder, ureters, and kidney. Among UTIs acquired in the hospital, approximately 75% are associated with a urinary catheter inserted into the bladder through the urethra to drain urine, which are indicated in between 15-25% of hospitalized patients. The most important risk factor for developing a catheter-associated UTI (CAUTI) is prolonged use of the urinary catheter.

Image: Aston researcher preparing a ZnO laced glass rod (Photo courtesy of Aston University).

Pressurized Topical Oxygen Helps Heal Diabetic Foot Ulcers

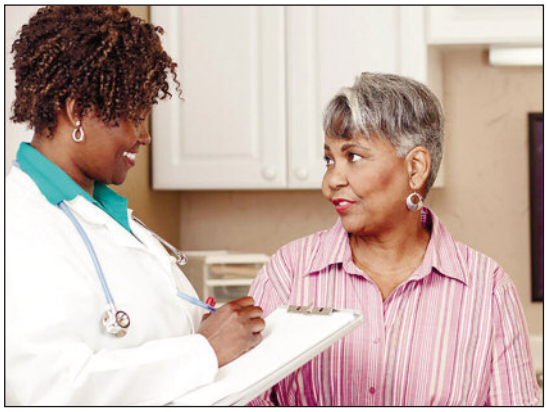
Topical wound oxygen (TWO_2) therapy can lead to a fourfold increase in chronic diabetic foot ulcer (DFU) healing, according to a new study.

Researchers at Northwick Park Hospital (London, United Kingdom; www.lnwh.nhs.uk/northwick-park-hospital), Midwestern University (Glendale, AZ, USA; www.midwestern.edu), Montpellier University Hospital (France; www.chu-montpellier.fr), and other institutions conducted a study involving 220 patients to assess the efficacy of multimodality cyclical pressure TWO2 home care therapy in healing refractory DFUs that failed to heal with standard of care alone. Patients with diabetes and chronic DFUs were randomized to either active TWO_2 therapy or to sham control, which was operatively identical, apart from the delivery of oxygen.

After training, the patients treated themselves at home for 90 minutes, five times per week for 12 weeks or until the wound healed, with dressing changes performed by the patient themselves or by caregivers. The patients also visited their local study center every weekl for wound assessment, debridement, and photography, during which diary cards recording therapy delivery and daily off-loading compliance were verified. The primary outcome was 100% healing at 12 weeks.

The results showed that active TWO2 was superior to sham, with a closure rate of 41.7% at 12 weeks, as compared to 13.5% with standard care. After treatment was completed, the patients were followed for a maximum of 38 weeks, at which point wound closure assessment and quality of life questionnaires were administered. At that time, only one (6.7%) of 15 healed ulcers in the active arm recurred at 12 months, compared to two (40%) of five healed ulcers in the sham arm. Two patients in the active arm and three in the sham arm underwent index limb amputations. The study was published on October 16, 2019 in *Diabetes Care.*

Early Menopause Can Predict Heart and Vascular Disease



A new study suggests that women who reach menopause before the age of 50 have an increased risk of cardiovascular disease (CVD).

Researchers at the University of Queensland (UQ; Brisbane, Australia; www.uq.edu.au), Karolinska Institutet (KI; Solna, Sweden; www.ki.se), the University of Hawaii (Hilo, USA; www.hawaii.edu), and other institutions conducted a study to assess the associations between age at natural menopause and incidence and timing of CVD. To do so, they pooled individual-level data from 15 observational studies across five countries and regions between 1946 and 2013. The primary endpoint was the occurrence of first non-fatal CVD, adjusted to account for smoking status, menopausal hormone therapy status, body mass index (BMI), and education levels.

Age at natural menopause was categorized as premenopausal or perimenopausal, younger than 40 years (premature menopause), 40-44 years (early menopause), 45-49 years (relatively early), 50-51 years (reference category), 52-54 years (relatively late), and 55 years or older (late menopause). Women who underwent a hysterectomy or oophorectomy and those women who did not report their age at menopause were excluded from analysis. In all, 301,438 women were included in the meta-analysis.

The results revealed that 4.3% of the women had a first non-fatal CVD event after menopause, of which 3.1% had coronary heart disease (CAD), and 1.4% had a stroke. Risk of CVD was higher in women who had premature menopause, early menopause, and relatively early menopause, with a considerably reduced risk of CVD following menopause after age 51 years. Associations persisted in never smokers, and were strongest before age 60 years for women, but were attenuated at age 60-69 years, with no significant association observed at age 70 years and older. The study was published on October 3, 2019, in *Lancet Public Health.*

"Identifying women with early menopause offers a window of opportunity for their doctors to work with them to monitor and actively manage cardiovascular disease risk factors," said lead author Dongshan Zhu, PhD, of the UQ School of Public Health. "The findings will have important clinical and public health implications. Early clinical diagnosis will help to improve overall cardiovascular health in women in their postmenopausal years."

Menopause describes the permanent cessation of the primary functions of the human ovaries, including cessation of estradiol and progesterone production, which are a part of the body's endocrine system of hormone production. After menopause, estrogen continues to be produced in other tissues, notably the ovaries, but also in bone, blood vessels and even in the brain; but a dramatic fall in circulating estradiol levels at menopause impacts many tissues, from bone to brain to skin.

Image: A new study suggests that early menopause entails a higher risk of cardiovascular disease (Photo courtesy of iStockPhoto).

Magnetic Blood Filtering System Draws out Disease

An innovative blood filtering system could draw out deadly infections such as malaria and sepsis from the body using magnets.

The MediSieve (London, UK; www.medisieve.com) filtering technology works in a similar way to dialysis. Blood is taken from a patient and infused with the MediSieve magnetic particles, which attach to specific targets so that they can be subsequently captured by a magnetic filter and removed from the blood before it is pumped back into the body. Particle size, magnetic properties, and number of binding agents coating the nanoparticles are all engineered to ensure maximal capture and removal by the filter. The whole process takes around two to four hours.

"In theory, you can go after almost anything. Poisons, pathogens, viruses, bacteria, anything that we can specifically bind to, we can remove. So, it's a very powerful potential tool," said George Frodsham, CEO and founder of MediSieve. "When someone has a tumor, you cut it out. Blood cancer is a tumor in the blood, so why not just take it out in the same way? Now we know it's possible; it's just a question of figuring out some of the details." Blood can be repeatedly passed through the system until the target is at such a low concentration that the immune system or a short course of medication can remove it. The first disease due to be tested for device efficacy is malaria; interestingly, in this case, the first step is not necessary, as malaria targets iron-rich blood cells and consumes hemoglobin, turning it magnetic. Further trials will be conducted to see whether the nanoparticles can remove sepsis-causing bacteria and tone down the deadly immune response.

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PRODUCT NEWS

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FETAL/MATERNAL MONITOR
Huntleigh Diagnostics

The Sonicaid Team 3 Series fetal/maternal monitor is easy to use and intuitive via the icon-driven touch-screen, providing cost-effective, reliable and accurate fetal/maternal monitoring.

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VITAL SIGNS MONITOR
CMICS Medical

The PM-800A vital signs monitor features a 2.8 inch color LCD for real time display of SpO2 waveform and PR strength and provides an audible and visual alarm when the parameters are exceeded.

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BLADDER VOLUME MEASUREMENT DEVICE
CR BARD

The BBS Revolution is a fully automated bladder volume measurement device that combines the power and safety of ultrasound with sophisticated image processing electronics and software.

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Focused Ultrasound Relieves Tremors in Parkinson's Patients

Magnetic resonance-guided focused ultrasound (MRgFUS) can improve quality of life in people with essential tremor (ET) or Parkinson's disease (PD) tremor, according to a new study.

Researchers at the University of L'Aquila (Italy; www.univaq.it) conducted a study involving 39 patients (average age 64.5 years), who suffered from disabling tremors for an average of more than 10 years, and that had not responded to treatment. The patients (18 with ET and 21 with PD) were evaluated for tremor severity and quality of life before MRgFUS thalamotomy, immediately after treatment, and over the course of the ensuing year. The procedures were performed with the InSightec (Dallas, TX, USA; www.insightec.com) ExAblate Neuro device, under guidance of a 3T magnetic resonance imaging (MRI) scanner. The results showed that in 95% of the patients, substantial and immediate reduction of tremor severity was seen, which was sustained during follow-up evaluations. Patient response to treatment, which was measured by calculating fractional anisotropy values in the ventral intermediate nucleus, correlated with the severity of tremors changes under the Fahn-Tolosa-Marin scale. Quality of life improved substantially in both the ET and PD groups. The study was presented at the annual meeting of the Radiological Society of North America (RSNA), held during December 2019 in Chicago (IL, USA).

"As a minimally invasive approach, focused ultrasound has advantages over deep brain stimulation, including a reduced risk of complications from bleeding and infections," said lead author radiologist Federico Bruno, MD, of the department of biotechnological and applied clinical sciences at the University of L'Aquila. "Another advantage is the immediate effect this treatment provides, unlike deep brain stimulation which requires a break-in period for the electrostimulation. Additionally, treatment with MRgFUS requires shorter hospitalization, and is a fairly well-tolerated procedure even by more fragile patients."

"Currently, MRgFUS thalamotomy is only available at a limited number of sites worldwide. Few patients know of this treatment option so far, and there are not many specialized centers equipped with the required technology," concluded Dr. Bruno. "The clinical application of this technique for neurological diseases is an absolute novelty. Improvements in neuroimaging techniques that allow for greater precision and detail in planning, implementation, and monitoring over time of the treatment should also expand its availability."

MRgFUS thalamotomy is an incisionless interventional radiology procedure in which focused beams of sound energy are used to heat and destroy the thalamus. The procedure gives relief to the opposite side of the body, meaning that treatment to the right side of the brain would relieve tremors on the left side of the body, and vice versa.

Image: ET patient about to undergo MRgFUS (Photo courtesy of Federico Bruno/ University of L'Aquila)

Nasal Delivery Device Treats Acute Epileptic Seizures

A nasal rescue system offers a ready-to-use, one-step option to treat acute repetitive seizures in those with epilepsy.

The Aptar (Crystal Lake, IL, USA; www.aptar.com) Unidose Liquid System is designed to deliver a small, but precise amount of liquid midazolam-- a benzodiazepine commonly used for anesthesia, procedural sedation, and severe agitation--intra-nasally, with high deposition in targeted areas of the nose-to-brain pathway, thus allowing the therapeutic compound to enter the central nervous system (CNS) rapidly. To deliver the100 µl liquid dose, a small plunger on the bottom of the device is pressed, releasing the drug in a single spray into the nostril, where it can be absorbed via the nasal mucosa.

The system is ready-to-use, does not require priming, and can be easily used with one hand, from any direction, even by a bystander with little training. In order to help patients and caretakers develop a familiarity with the device and its use ahead of a potential emergency, they can practice administering the drug with a trainer device that mimics the actual system. The trainer was developed by Aptar subsidiary Noble International (Orlando, FL, USA; www.gonoble.com).

"The launch of our Unidose System nasal rescue treatment for seizure activity once again demonstrates Aptar Pharma's ability to help our customers develop and launch complex treatments," said Gael Touya, president of Aptar Pharma. "When we combine our nasal systems' capabilities with Noble's training devices for onboarding, we bring added value to our customers and further convenience for patients and consumers worldwide." The olfactory epithelium, situated in the upper posterior part of the nasal cavity, covers approximately 10 cm2 of the human nasal cavity.

Headache after Childbirth Epidural Could Indicate Subdural Hematoma

Women who experience headaches following neuraxial anesthesia prior to giving birth have a greater risk of developing intracranial subdural hematoma (ISH), according to a new study. Researchers at McGill University (Montreal, Canada; www.mcgill.ca) and the University of Toronto (UT; Canada; www.utoronto.ca) reviewed the outcomes of 22,130,815 patients and deliveries in the United States between January 2010 and December 2016 in order to determine the association of post-dural puncture headache with postpartum ISH. Patients were included if they had two months of follow-up data, and did not receive a diagnostic lumbar puncture. The main outcome was ISH in the two-month postpartum period, with secondary outcomes including in-hospital mortality and occurrence of neurosurgery.

In all, there were 68,374 post-dural puncture headaches, for an overall rate of 309 per 100,000. There were 342 cases of ISH identified, indicating an incidence rate of 1.5 per 100,000 women. Of these, 100 cases were in women with post-dural puncture headache, indicating a rate of 147 hematoma cases per 100,000 deliveries in this subgroup. After adjustment for maternal age, cesarean delivery, hypertension, preeclampsia, and other co-morbidities, post-dural puncture headache had an odds ratio for subdural hematoma of 199, and an adjusted absolute risk increase of 130 per 100,000 deliveries. The study was published on September 16, 2019, in *JAMA Neurology.*

"When a patient has a post-dural puncture headache, they are at risk for a subdural hematoma, which can result in serious morbidity and increased mortality, and needs to be considered by any clinician looking after these patients," said lead author Albert Moore, MD, of McGill University. "The risk is higher in patients who have coagulopathy, previous cerebral arteriovenous malformations, and hypertensive disease, and there is also a possibility that delaying a blood patch may increase the risk of developing a subdural hematoma."

Post-dural puncture headache is thought to be caused by decreased intracranial pressure attributable to the leakage of cerebrospinal fluid (CSF) through the dural disruption, which places traction on pain-sensitive structures. Treatment often involves a blood patch, which is the injection of autologous whole blood into the epidural space. As pregnant women frequently receive neuraxial anesthesia for childbirth, they may develop symptoms of a post-dural puncture headache after their hospital discharge.

Image: A new study suggests that headaches after epidural anesthesia could indicate brain-bleed (Photo courtesy of iStock).

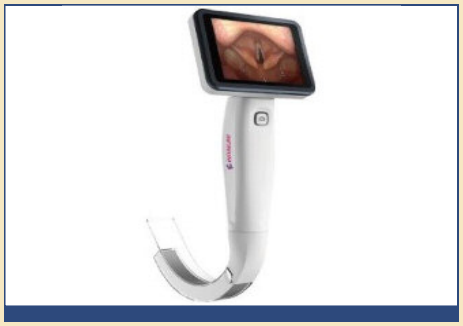
Neuromodulation Technology Reduces Opioid Use

A new study shows that a combination of ice and focal vibration could serve as an alternative pain relief therapy to addictive controlled substances such as opiates.

The Pain Care Labs (San Antonio, TX, USA; www.paincarelabs.com) VibraCool device uses a combination of cooling and high-frequency, low-amplitude, vibratory oscillation in order to target mechanoreceptors that inhibit pain. The device is based on gate control theory, which claims that the final common neural pathway of pain to the brain can be physiologically overwhelmed by transmitting cold and vibration to the central nervous system (CNS), similar to how running a burn under cold water stops the pain. The battery-powered VibraCool is based on the patented Oscillice neuromodulation platform.

An independent pilot study on opioid use following anterior cruciate ligament reconstruction (ACLR) examined pain levels and the number of opioid tablets used by 14 patients over a period of seven days; the patients were tracked on a mobile phone application. The results showed that on average, VibraCool patients used 35% fewer opioids than the control group, and 12 were off opioids by their follow up visit. The study was presented at the American Academy of Physical Medicine and Rehabilitation (AAPM&R) annual assembly, held during November 2019 in San Antonio (TX, USA). "The human body is designed to adapt to motion. Recent research shows specific vibration frequencies benefit physical therapy and improve post-surgical outcomes. When combined with cryotherapy, vibration can block even intense post-operative and rehab pain," said Amy Baxter, MD, CEO and chief medical officer of Pain Care Labs. "By applying the technology we've been using for sharp pain for a decade, we can effectively reduce chronic pain with noninvasive, non-pharmaceutical methods.

VIDEO LARYNGOSCOPE
ClearVue



The ClearVue video laryngoscope features a 2 mega-pixel full-view camera with video capability, a 3.5 inch high-resolution monitor and rechargeable li-ion battery for extended use.

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SURGICAL LIGHT
MAVIG

The LED5 MC large surgical light with LED technology provides high contrast and precise illumination. It is available as multi-color LED (MC) and with a multi-faceted lens system.

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SURGICAL ABLATION SYSTEM
Medtronic

The Cardioblate 68000 is an easy-to-use portable surgical ablation system generator that features an advanced dose-response algorithm and touch screen operation for adjusting ablation parameters.

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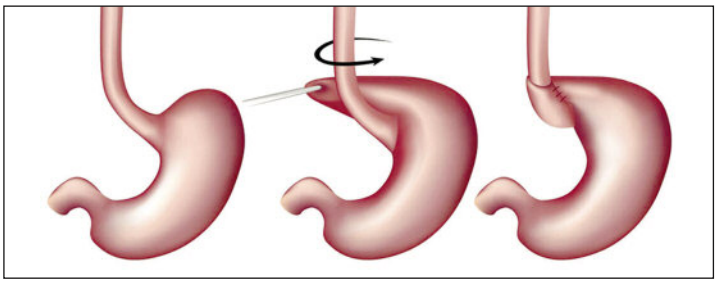
Fundoplication Helps Relieve Refractory Heartburn

For gastroesophageal reflux disease (GERD) patients that are refractory to proton pump inhibitors (PPIs), surgery offers the better option, according to a new study.

Researchers at Baylor University Medical Center (Dallas, TX, USA; www.bswhealth.com), the VA Office of Research and Development (Washington, DC, USA; www.research.va.gov), the University of Maryland (Baltimore, USA; www.umd.edu), and other institutions conducted a study involving 78 patients referred to Veterans Affairs (VA) gastroenterology clinics for PPI-refractory heartburn, a frequent clinical problem with multiple causes. Treatments for PPI-refractory heartburn are of unproven efficacy, and focus on controlling GERD with reflux-reducing medication (such as baclofen), antireflux surgery, or dampening visceral hypersensitivity with neuromodulators such as desipramine.

Study patients were randomly assigned to receive surgical treatment via laparoscopic fundoplication, medical treatment that included the PPI omeprazole plus baclofen (with desipramine added depending on symptoms), or to a control medical treatment (omeprazole plus placebo). The results revealed that the incidence of treatment success with surgery (67%) was significantly superior to that with active medical treatment (28%) or control medical treatment (12%). The study was published on October 16, 2018, in the *New England Journal of Medicine (NEJM)*.

"GERD is an extremely common problem, and heartburn is the main symptom. PPIs are the best treatments we have, but as many as 30% of people still have symptoms when taking PPIs," said lead author Stuart Jon Spechler, MD, chief of gastroenterology at Baylor University Medical Center. "There are a lot of other things that can cause that burning feeling, and patients can't tell if they have reflux or another kind of heartburn. If their heartburn isn't reflux-related, surgery won't provide relief. We only want to operate on the group that will benefit from the surgery."



In GERD patients, the esophageal sphincter is weakened and does not close tightly, allowing digestive juices to return and irritate the esophageal lining. Treatment options usually include lifestyle changes, medications such as over-the-counter antacids and PPIs, and laparoscopic Nissen fundoplication to reinforce and strengthen the lower esophageal sphincter (LES). The procedure involves folding and wrapping the upper portion of the stomach around the lowest portion of the esophagus, much the way a bun wraps around a hot dog.

Image: Nissen fundoplication is a good option for PPI-refractory heartburn (Image courtesy of Shutterstock).

Novel Technology Provides Real-Time Perfusion Monitoring

A new monitoring system offers real-time perfusion feedback, enhancing clinician's decision-making in the angiography suite.

The Pedra Technology (Singapore; www.pedratech.com) Pedra system is a non-invasive, deep tissue, real-time tissue perfusion monitor intended for use in peripheral angioplasty and vascular surgery. The device is based on advanced speckle laser technology, providing a simple five-minute, non-invasive test to distinguish between ischemic ulcers resulting from peripheral vascular disease (PVD) and neuropathic diabetic foot ulcers (DFUs). The resulting Pedra Blood Perfusion Index can indicate the need for urgent vascular surgery.

During such surgical procedures, the Pedra device provides an accurate and quantitative measure of blood perfusion, a critical factor in wound healing. Current technologies, such as X-ray angiograms, only image the macrovascular blood flow, which could lead to misleading conclusions that may result in adverse outcomes or the need for repeat procedures. By using Pedra, the physician receives precise information on the blood perfusion status to increase the likelihood of surgery success, saving limbs and reducing the healthcare burden.

"Physicians and their industry partners have directed significant resources to determining the optimal treatment for patients with PAD, be it a balloon, a stent or another treatment," said vascular surgeon Paul Hayes, MD of Addenbrookes Hospital (Cambridge, United Kingdom). "Far less time has been spent asking the question 'has the treatment I have chosen for this individual patient really improved outcomes'? PEDRA Technology has developed a new device that could possibly revolutionize the management of patients with PAD."

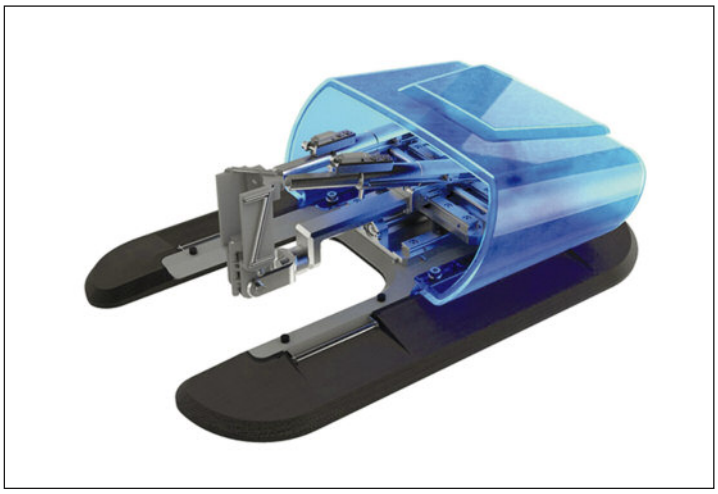
The current gold standard for frontline diagnosis of ischemia is the Ankle-Brachial Index, which has a real-world sensitivity of 16-20%. ABI is widely appreciated as being a very poor test for diabetic limbs, because patients with diabetics often have calcified blood vessels. As a result, their ankle vessels are incompressible by the blood pressure cuff, resulting in falsely-elevated ABI readings that fall within the healthy range.

Robotic Surgery System Guides Needle-Based Procedures

A hands-free robotic surgery system uses image-based planning tools and navigation systems to insert and steer various instruments to a desired location within the body.

The XACT Robotics (Caesarea, Israel; www.xactrobotics.com) is a novel, patient-mounted, five degrees-of-freedom robot designed to facilitate predictable delivery of needles and various other instruments to a desired target within an accuracy range of within 1.5 millimeters, with concomitant planning of the proposed needle path. Once the desired target and the proposed trajectory are confirmed, the XACT technology assures hands-free insertion and steering, while at the same time compensating for any instrument deviation. In addition, the needle path can be adjusted without reinserting it or repositioning the patient.

The technology also compensates for breathing and patient movement intraoperatively, contributing to a predictable and safe performance that minimizes procedure duration. Additional features include a small footprint, high mobility, and ease of use, which enable care providers to treat a broad range of patient care needs in various clinical sites of service. XACT technology is designed to be compatible with a broad range of imaging modalities, including computerized tomography (CT)-guided percutaneous interventions, tissue biopsies, abscess drainage, or ablations.



"We are committed to redefining the way the entire medical community utilizes robotics, beginning with interventional radiologists," said Harel Gadot, founder, executive chairman, and president of XACT Robotics. "Being the first to introduce a hands-free robotic system, we have the potential to provide significant clinical, technical and economic value while democratizing interventional procedures. Our system's small footprint and high mobility design will enable care providers to treat a broad range of patient care needs in various clinical sites of service."

"The XACT Robotic System provides a unique platform to the interventional radiology community which can help improve the delivery and quality of care for the patients we serve," said Professor Nahum Goldberg, MD, director of the Applied Radiology Research Lab at Hadassah Hebrew University Medical Center (Jerusalem, Israel). "Based on our experience with this unique robotic technology, we can reach very small targets with unprecedented accuracy. Furthermore, this system holds much promise for enabling more efficient use of time and hospital resources."

Image: The XACT Robotics needle trajectory system (Photo courtesy of XACT Robotics)

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BenQ Medical Technology

The SE26101 surgical display features a 14-bit 3D color lookup table and Dual-Source Display that allows surgeons to display two independent video sources side-by-side on a single monitor.

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BREAST BIOPSY SYSTEM
Hologic

The Brevera breast biopsy system streamlines the entire breast biopsy process from start to finish – with real-time imaging for instant verification and automated post-biopsy specimen handling.

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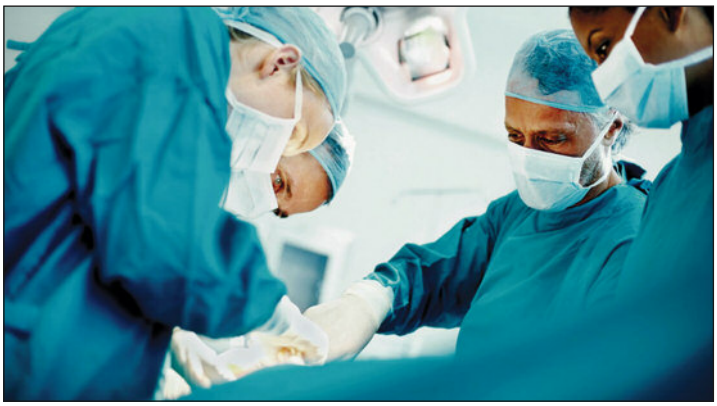
Bariatric Surgery Reverses Subclinical Heart Disease

A new study suggests that weight loss surgery can benefit subclinical myocardial function in the severely obese, both with and without type 2 diabetes (T2D).

Researchers at the Quebec Heart and Lung Institute (Canada; http://iucpq.qc.ca) conducted a study that included 38 obese patients who underwent bariatric surgery and 19 patients, matched for age and sex, who remained on the surgical waiting list. Pre-surgical measurements included echocardiography, body weight, blood pressure, blood lipids, and blood glucose. Six months into the study, patients in the surgery group had lost 26% of their total body weight, while those on the waiting list remained the same weight.

The results revealed that rates of comorbidities were significantly lower in the surgery group compared to the waiting list group: 30% versus 61% for hypertension, 5% versus 42% for dyslipidaemia, and 13% versus 40% for T2D, respectively. Of the patients in the surgery group with subclinical heart disease at the start of the study, 82% were normalized at six months after surgery. In contrast, subclinical cardiac disease worsened in 53% of patients on the waiting list during the same period. The study was presented at the annual EuroEcho scientific congress, held during December 2019 in Vienna (Austria).

"Bariatric surgery was conceived for weight loss; our study indicates it may also reverse subclinical heart dysfunction; its reversal could translate into improved prognosis," said lead author and study presenter Marie-Eve Piché, MD. "Interestingly, remission of T2D after bariatric surgery was associated with improvement in subclinical heart function. Conversely, obese individuals with T2D who remained on the surgical waiting list showed a worsening in their subclinical myocardial function during follow-up."



For patients with morbid obesity, bariatric surgery, including Roux-en-Y gastric bypass (RYGB) surgery, is an effective treatment for weight loss and diseases associated with obesity. However, various medical, nutritional, and surgical symptoms requiring treatment may occur after RYGB surgery and may impair patients' quality of life.

Cartography Techniques Help Calculate Spine Curvature

Cutting-edge imaging technology can be used to produce three-dimensional (3D) anatomic maps of the spine to aid people with scoliosis, according to a recently launched trial.

The technique, developed at the Hospital for Special Surgery (HSS, New York, NY, USA; www.hss.edu) and the Israel Institute of Technology (Technion; Haifa, Israel; www.technion.ac.il), combines two advanced imaging technologies. The first is stereophotogrammetry via a highly accurate topographical 3D surface imaging system that is manufactured by 3dMD (Atlanta, GA, USA; www.3dmd.com); and the second is the EOS Imaging (Paris, France; www.eos-imaging.com) biplanar x-ray imaging platform, which determines spinal alignment while significantly reducing exposure to ionizing radiation.

The 3dMD system combines information from 30 high-definition cameras to produce a full map of the torso in under a second. EOS imaging provides images of the patients in natural standing positions using perpendicular X-ray beams collimated in two very thin, horizontal, fan-shaped beams, which along with two variable gain detectors, provides a high contrast digital radiograph (DR) that uses a significantly lower radiation dose than a general radiography X-ray. This enables clinicians to make a more informed diagnosis and create individualized treatment plans for children with musculoskeletal disorders.

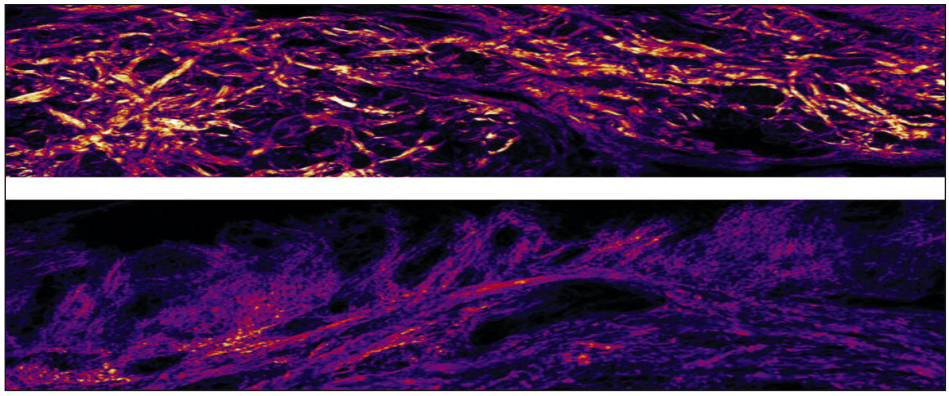
"This technology is essentially producing the world's most advanced selfie, and the benefit is that there's nothing dangerous about it. When you image with this system, you can count the number of hairs on a person's leg," said senior investigator Howard Hillstrom, PhD, director of the motion analysis lab at HSS. "The speed of the process is a significant advantage over conventional imaging, as up to ten to twenty percent of torso x-rays must be redone because inadvertent movements during the scans distort the picture; 3dMD is immune to that."

"Being able to use this technology to screen patients for scoliosis would be a big improvement over the current method, which uses a carpenter's level on a patient's back and has a very high rate of false-positives," added Roger Widmann, MD, chief of the pediatric orthopedic surgery service at HSS. "You're taking x-rays on a lot of kids who don't need them, so we need a very reliable technology that correlates with x-rays so that you can safely decide if you need one or not. We'd love to have a better tool for this."

Transplanted Plantar Skin Cells Could Reduce Stump Injury

Re-engineering stump skin using skin cells from the sole of the feet could help amputees tolerate prosthetics more comfortably, according to a new study.

Researchers at Imperial College London (Imperial; United Kingdom; www3.imperial.ac.uk) developed computational models to analyze the make-up of the skin on the soles of the feet, and how it behaves differently to regular skin under pressure. They found that the outermost layer of sole skin, the stratum corneum, plays the biggest role in protecting skin from tears and blisters, as it is much thicker in sole skin than other skin types. They also found that the thickness of the skin was not the key factor, but rather how the structural proteins, keratin and collagen, were arranged.



Plantar epidermis, which lies below the stratum corneum, contains far more total keratin, as well as different types of keratin, than in other skin, helping sole skin to resist breakages. Similarly, collagen is arranged in much thicker bundles, and the collagen fibers themselves are thicker. The combination of all these factors result in plantar skin that is tougher and more resistant to injury than body skin, which could be useful characteristics for amputees, if they could be incorporated in stumps. The researchers have already defined several potential avenues to do so.

These include incorporating genetic material into stump skin to help it grow thicker, and using sole skin-inspired skin grafts. The researchers also suggest manipulation of the genetic material that's already in stump skin to change its make-up. For example, fibroblasts could be transplanted, which could trigger the production of collagen and alter the type of keratin produced, making skin layers thicker over time.

Alternatively, plantar skin cells could be grown in-vitro, which could then be grafted onto stumps. The study was published on October 9, 2019, in *Science Advances*.

"A thick stratum corneum is most important to protect skin from stress-induced injuries such as skin tears and blisters, while the composition of each skin layer is most important for protection against deformation-induced injuries such as pressure ulcers," said senior author Claire Higgins, PhD, of the department of mechanical engineering. "The combined approach of multiscale mechanical testing and computational modeling can now be extended to investigate age-related skin changes and to enhance the load tolerance of engineered skin substitutes."

Image: Collagen bundles fibers are much thicker in plantar skin (top) than body skin (bottom). (Photo courtesy of Imperial).

3D Model Helps Elucidate Pediatric Cloacal Malformation

A new study describes how three dimensional (3D) models of congenital cloacal malformation can facilitate endoscopic cystoscopy and complex surgical correction.

Developed at the Medical University of Vienna (MedUni; Austria; www.meduniwien.ac.at), the cloacal malformation (also known as anal atresia) 3D model was reconstructed from computerized tomography (CT) data of a real malformation. The model can be used to practice the difficult operation realistically in a non-invasive way, facilitating care of the most complex cloacal malformations, and improving patient outcomes. Training sessions on the 3D model can allow a more precise "real world" operation, helping prevent the newborn patients from suffering permanent incontinence or infertility.

At the conclusion of the 3D reconstruction process, the surgical team should be able to clarify the length of the common channel, the length of the urethra, the anatomy of the vagina or vaginas, the anatomy of the upper genital tract, locations of the rectal fistula and the true rectum, and its position in the pelvis, notably the pubo-coccygeal line. The information allows the surgical team to decide on an appropriate surgical strategy. The study was presented at the 12th European Pediatric Colorectal and Pelvic Reconstruction congress, held during December 2019 in Vienna (Austria).

"This model allows pediatric surgeons and urologists to practice using cystoscopy and identifying the internal structures," said study presenter Carlos Reck, MD, of the department of surgery. "In future, models could be used not only to train surgeons in this rare condition, but also to practice the operation for a specific patient prior to the initial procedure. This will have a very positive impact upon the outcome for patients."

A cloacal malformation is most often identified by the midwife directly after birth or by the pediatrician during the initial examination, usually involving an external or internal fistula in the anus that has to be surgically reconstructed in the center of the sphincter muscle. Different forms of anal atresia can involve additional malformations; for example, a fistula can occur between the rectum and urethra in boys and between the rectum and vagina in girls. Depending on the malformation, surgical correction could also include an artificial outlet created for the colon.

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The PlumeSafe Turbo is a powerful portable surgical smoke evacuator featuring Turbo Mode to significantly increases the airflow to quickly remove smoke from the surgical site.

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SURGICAL NAVIGATION SYSTEM
Claron Technology

The Navient ENT is a simple, accurate and affordable surgical navigation system designed for convenient routine use for inpatient and outpatient ENT and transnasal interventions.

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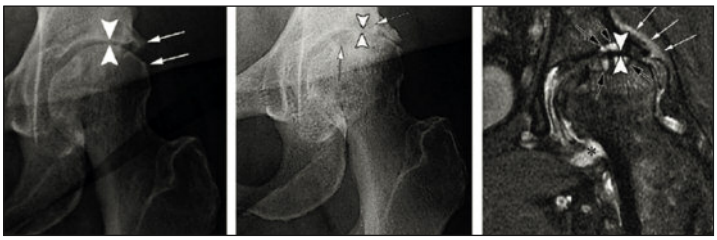
Steroid Injections May Damage Hip and Knee Joints

A new study suggests that intra-articular corticosteroid (IACS) injections could lead to accelerated joint destruction, and may hasten the need for total hip and knee replacements.

Researchers at Boston University School of Medicine (BUSM; MA, USA; www.bumc.bu.edu/busm), the French National Institute of Sports (INSEP; Paris, France; www.insep.fr), and Friedrich-Alexander University Erlangen-Nürnberg (FAU; Germany; www.fau.eu) undertook a review of the existing literature in order to describe observed adverse joint events following the administration of IACS injections to treat osteoarthritis (OA) pain, and also to provide an outlook on how this may affect clinical practice.

The researchers identified four main adverse outcomes: accelerated osteoarthritis progression with loss of the joint space, osteonecrosis complications, subchondral insufficiency fractures (stress fractures beneath the cartilage), and rapid joint destruction, including bone loss. They thus recommend careful scrutiny of patients with mild or no OA on X-rays who are referred for IASC, especially when the pain reported is disproportionate to imaging findings, and that patients need to be told of the potential consequences of a corticosteroid injection before they receive it. The study was published on October 15, 2019, in *Radiology*.

"Intra-articular joint injection of steroids is a very common treatment for osteoarthritis-related pain, but potential aggravation of pre-existing conditions or actual side effects in a subset of patients need to be explored further to better understand the risks associated," said lead author Professor Ali Guermazi, MD, PhD, of BUMC. "We've been telling patients that even if these injections don't relieve your pain, they're not going to hurt you. But now we suspect that this is not necessarily the case."



OA is a group of mechanical abnormalities involving degradation of joints, including articular cartilage and subchondral bone. Symptoms may include joint pain, tenderness, stiffness, locking, and sometimes an effusion. A variety of causes--hereditary, developmental, metabolic, and mechanical deficits--may initiate processes leading to loss of cartilage. As a result of decreased movement secondary to pain, regional muscles may atrophy, and ligaments may become more lax. OA of the knee affects about 250 million people worldwide (3.6% of the population).

Image: Progressive loss of acetabular and femoral cartilage and subchondral cystic changes after IACS (Photo courtesy of Ali Guermazi Radiology).

Innovative Mesh Implant Simplifies Soft Tissue Repair

A proprietary hernia repair device employs surface nano-modification technology for the repair of abdominal wall hernia defects, including direct and indirect inguinal defects.

The Exogenesis (Billerica, MA, USA; www.exogenesis.us) Hernia Mesh is constructed of monofilament polypropylene (PP) fibers warp knitted together, and a unique nanometer-level surface texture achieved via accelerated neutral atom beam (ANAB) technology designed to enable favorable post-implant tissue compatibility. The PP knitting process creates large pores and minimum density and thickness, resulting in an implant, which allows tissue ingrowth and long-term tissue support, simultaneously minimizing the inflammatory response and fibrous encapsulation related to implant mass.

The mesh is also treated using the ANAB process to modify the surface of the filaments on a nanometer scale. The low-energy nano-scale surface modification is created by acceleration of neutral argon (Ar) atoms with very low energies under vacuum, which bombard the PP surface, modifying it to a shallow depth of 2-3 nm, causing modifications of surface topography, structure, and energy. Exogenesis Hernia Mesh is indicated for the repair of abdominal wall hernias and abdominal wall deficiencies, but is not indicated for transvaginal pelvic organ prolapse repair.

"ANAB surface treatment technology is already being deployed on other devices, however Exogenesis Hernia Mesh is our first proprietary product developed entirely in-house," said Dmitry Shashkov, PhD, President and CEO of Exogenesis. "ANAB has the bioactive potential to improve medical device implant responses in man, and we are excited to bring this exciting technology one step closer to the clinical community."

Surgical meshes have been in use since the late 19th century. In recent years, research in the area has increased due to increasing numbers of post-surgery complications such as infection, fibrosis, adhesions, mesh rejection, and hernia recurrence. A wide range of materials and coatings, meshes with different fiber thickness and porosity, a variety of manufacturing methods, as well as surgical and implantation procedures have been tested. Recently, surface modification methods and nanofiber-based systems are actively being explored as a pathway to increase biocompatibility.

Surgical Meshes Impregnated with Manuka Honey Fight Infections

Sandwiching tiny amounts of Manuka honey between surgical mesh layers can provide protection against bacterial infection for up to three weeks, according to a new study.

Developed by researchers at Ulster University (Newtownabbey, United Kingdom; www.ulster.ac.uk), the University of Leeds (United Kingdom; www.leeds.ac.uk), Newcastle University (United Kingdom; www.newcastle.ac.uk), and other institutions, the surgical mesh was created via layer-by-layer (LBL) nanotechnology assembly by sandwiching eight layers each of negatively charged Manuka honey nanolayers and a positively charged biomimetic electrospun poly(ε-caprolactone) polymer. Each layer was just 10-20 nm in thickness.

Different cell lines, including human immortalized and primary skin fibroblasts, and primary endothelial cells, were exposed to the mesh to confirm membrane cytocompatibility. The Manuka honey meshes were then exposed to various Gram-negative and Gram-positive bacteria responsible for infections in the body, such as *Staphylococcus, methicillin-resistant Staphylococcus aureus* (MRSA), and *E. coli.* The results showed that antimicrobial MH activity was dependent on the concentration used, and the strains tested. The study was published on December 4, 2109, in *Frontiers in Bioengineering and Biotechnology.*

"Honey has been used to treat infected wounds for thousands of years, but this is the first time it has been shown to be effective at fighting infection in cells from inside the body," said senior author Piergorgio Gentile, PhD, of Newcastle University. "Similarly layered antibiotic-releasing coatings to protect implants against bacterial infection have been judged as failing to provide durable protection, as it could encourage the development of drug resistant bacterial strains."

Manuka (*Leptospermum*) honey is made from the tree species Leptospermum, found in New Zealand and Australia. The antibacterial effect of Manuka honey is due to the presence of methylglyoxal (MGO), which forms from the compound dihydroxyacetone (DHA) present in nectar, and converted into MGO during the ripening of honey. The level of MGO in Manuka honey is 100 or more times higher than in other types of honey.

Image: Dr. Piergorgio Gentile and Manuka honey (Photo courtesy of Newcastle University)

Combination Polypectomy Snare Reduces Need for Device Exchange

A hybrid hot/cold snare with a unique hexagonal shape provides optimal flexibility and stiffness for accurate placement on tissue, and precise cutting ability.

The Olympus Medical (Olympus; Tokyo, Japan; www.olympus-global.com) SnareMaster Plus allows for precise manipulation and control when capturing polyps, while maintaining an appropriate margin of normal tissue required during cold snare polypectomy. The thin (0.3 mm) coated wire design retains loop stability and shape, even after multiple cuts, maintaining an optimal stiffness that facilitates clean, sharp, cold cutting. The device also provides 2-in-1 hot and cold polypectomy options, reducing the need for two separate snares, and is available in both 10 and 15mm sizes to meet various clinical needs.

"As the company that brought polypectomy to the fore as a viable approach, we are pleased to come full circle with a hybrid snare that provides clinical, cost, and time-savings benefits to the procedure room," said Kurt Heine, group vice president at Olympus America. "Adding a cold snare is important to the SnareMaster portfolio, because cold snaring can potentially lead to fewer post-polypectomy complications. SnareMaster Plus is being made available to customers immediately."

"In our practice, up to 80% of polyps can be removed with a cold snare. The Olympus SnareMaster Plus has excellent characteristics that enable clean resection margins with excellent cutting capabilities. The Olympus SnareMaster Plus is a significant step forward in the care of GI patients," said Paul A. Akerman, MD, of University Gastroenterology (Providence, RI, USA).

Colonoscopic polypectomy involves the removal of any polyp lesion--hyperplastic, adenomatous, villous adenoma, or polypoid (lymphoid hyperplasia)--by colonoscopy. The polyps can be small, large, sessile (flat), or pedunculated, growing on stalks like mushrooms. Small polyps (i.e., less than 5 mm) can be removed by biopsy forceps, but larger one requires a snare for removal, with any remaining tissue or stalk cauterized.

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VIDEO SIGNAL CONVERTER
Ampronix

The Scanmaxx Laplinx medical video signal converter is the first of its kind to allow users to connect their laptops via USB to PACS displays, supporting both widescreen and standard aspect ratios.

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VIDEO/AUDIO MANAGEMENT HUB
Brandon Medical

The i2i video and audio management hub is a simple solution for managing and controlling user access to our medical videos with access to centralized recording and archiving.

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VIDEO MANAGEMENT SOLUTION
Eizo

The CuratOR Alipe IP-based video management solution transmits data without compression, ensuring optimum image quality, and is modularly expandable and scalable.

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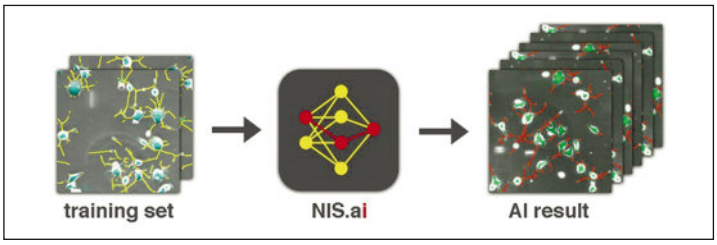
AI Module Delivers Predictive Image Segmentation and Processing

A powerful image analysis and processing module leverages deep learning and artificial intelligence (AI) to accurately extract unbiased data from vast amounts of microscopy datasets.

The Nikon Instruments (Melville, NY, USA; www.microscope.healthcare.nikon.com) NIS.ai microscopy image analysis and processing module is a suite of AI-based processing tools that utilizes convolutional neural networks (CNNs) in order to learn how to read images from small training datasets supplied by the user. The training results can then be applied to process and analyze huge volumes of data, allowing researchers to increase throughput and expand their application limits. The NIS.ai includes a suite of applications for predictive imaging, image segmentation, and processing. These include:



Convert.ai, which learns related patterns in two different imaging channels. After training, Convert.ai can predict the pattern in the second channel, even when presented with only the first channel. It can also be trained to predict where DAPI-based fluorescent staining of nuclei--a common method for cell segmentation and counting--could be based on unstained differential interference contrast (DIC) or phase-contrast microscopy images. This enables users to perform nuclei-based image analysis without ever having to stain samples with DAPI or acquire a fluorescent channel.

Segment.ai, which enables complex structures to be easily identified and segmented. Neurites in phase-contrast images are traditionally difficult to define by classic thresholding. Segment.ai can be trained on a small subset of hand-traced neurites to automatically detect and segment neurites from thousands of untraced datasets.

Enhance.ai, which allows dim fluorescent samples with poor signal-to-noise ratio (SNR) to be enhanced by learning what a high signal-to-noise image looks like, via a process that compares under-exposed and optimally-exposed images. Enhance.ai can then restore details in under-exposed or dim fluorescent images, enabling researchers to gain more insights from their low-signal imaging applications.

Denoise.ai, which removes shot noise from resonant confocal images and can be performed in real-time. Applying Denoise.ai to resonant confocal imaging enables users to acquire confocal images at ultra-high speed without sacrificing image quality.

"The application of Deep Learning and AI to biomedical imaging is extremely powerful, and opening up unseen possibilities," said Steve Ross, PhD, director of products and marketing at Nikon Instruments. "With NIS.ai, researchers can easily apply deep learning to extract meaningful, unbiased data from large, complex datasets."

Image: A suite of microscopy applications aid predictive imaging, segmentation, and processing (Photo courtesy of Nikon Instruments)

Automated Modeling Synthesizes Brain Scan Templates

Automated neural network models accelerate the creation and customization of conditional atlases used in medical-image analysis.

Developed at the Massachusetts Institute of Technology (MIT, Cambridge, MA, USA; www.mit.edu) and Cornell University (Cornell; Ithaca, NY, USA; www.cornell.edu), the probabilistic model is based on one conditional neural network (CNN) that yields either universal or conditional templates, and another CNN that provides efficient alignment of the images to templates. The joint CNN is fed a random image from a dataset encoded with desired patient attributes; from that, it estimates an attribute-conditional atlas. The second CNN aligns the estimated atlas with the input image, generating a deformation field, which is then used to train a loss function to reduce deviations from a given value, thus learning to minimize differences between the learned atlas and each image.

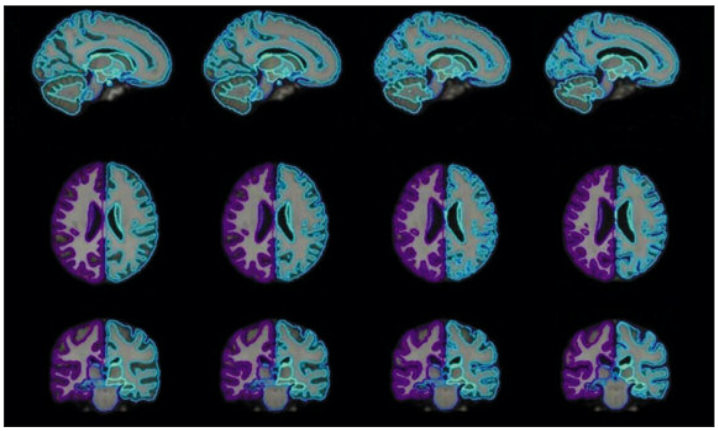


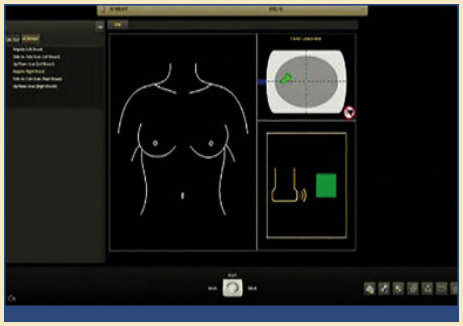
Image: On-demand brain scan templates of various ages generated using the joint CNN platform (Photo courtesy of MIT)

The networks continuously refine the atlas to smoothly align to any given image across the dataset. The result is an atlas that has learned how specific attributes, such as age, sex, and disease, correlate to structural variations across all images in a dataset. By plugging new patient attributes into the function, it leverages all learned information across the dataset to synthesize an on-demand atlas, even if that attribute data is missing or scarce in the dataset. The study was presented at the annual conference on Neural Information Processing Systems, held during December 2019 in Vancouver Canada.

"A big dream is to build one function that can generate conditional atlases for any subpopulation, spanning birth to 90 years old. Researchers could log into a webpage, input an age, sex, diseases, and other parameters, and get an on-demand conditional atlas," said lead author and study presenter Adrian Dalca, PhD, of MIT. "That would be wonderful, because everyone can refer to this one function as a single universal atlas reference. Atlases are central to many medical image analyses; this method can build a lot more of them, and build conditional ones as well."

Traditional atlas-building methods run lengthy, iterative optimization processes on all images in a dataset. For example, they align all 3D brain scans to an initial (often blurry) atlas, and compute a new average image from the aligned scans. They repeat this iterative process for all images. This computes a final atlas that minimizes the extent to which all scans in the dataset must deform to match the atlas. Doing this process for patient subpopulations can be complex and imprecise if there isn't enough data available. The atlases are available online at the MIT VoxelMorph library (http://voxelmorph.csail.mit.edu).

BREAST SCANNING SOFTWARE
Philips Healthcare



The Anatomical Intelligence for Breast (AI Breast) is a powerful software utilizing the eL18-4 transducer with integrated electromagnetic tracking coils, specially designed mattress and tabletop field generator.

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CONTRAST MANAGEMENT SYSTEM
Bracco

The NEXO Contrast Management System is a server-based application intended to be used as a data-management and visualization system, and provides the users with record-lists, graphics and reports.

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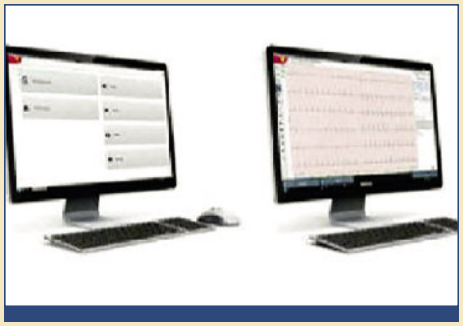
REMOTE FLEET SYSTEM
Schiller



The LifeDataNet G2 ensures that the defibrillators are always ready to use, regularly informing about the status of all devices. The plug and play system automatically connects compatible devices.

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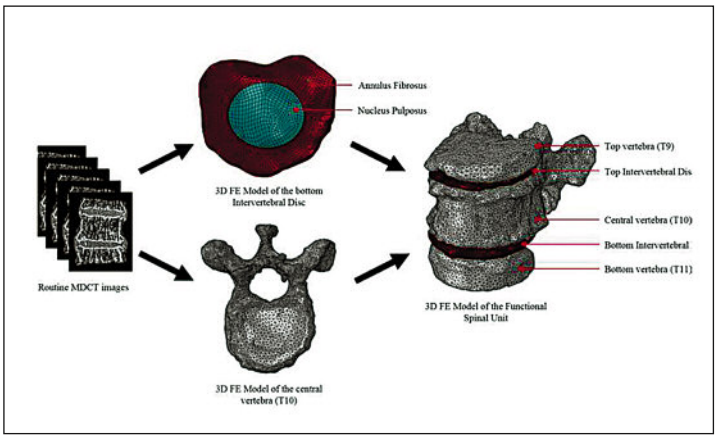
Finite Element Analysis Helps Predict Spinal Fractures

A new study introduces a novel vertebral strength assessment tool that can assist accurate prediction of osteoporotic vertebral fracture (OVF) risk.

Developed at the Singapore University of Technology and Design (SUTD; www.sutd.edu.sg) and Munich Technical University (TUM; Germany; www.tum.de), the semi-automatic computational tool is designed to extract structural information, such as failure load, from radiological scans of patients using functional spinal units (FSUs). The calculated FSU predicted failure load was compared to the bone mineral density (BMD) values of the single central vertebra with experimentally measured failure load in order to assess finite element (FE) correlation.



To do so, the FSUs underwent clinical multi-detector computed tomography (MDCT), and BMD was then determined for the FSUs from the MDCT images of the central vertebrae. FE-predicted failure load was then calculated in the single central vertebra alone, and the entire FSUs. The results revealed that while BMD of the central vertebrae correlated significantly with experimentally measured failure load, the FE-predicted failure load of the central vertebra showed no significant correlation. However, FE-predicted failure load of the FSUs best predicted experimentally measured failure load. The study was published on December 10, 2019, in *Spine*.

"There is an urgent need to implement computational biomechanical analysis in the clinical scenario, since it is a powerful tool for non-invasive evaluation of bone strength," said senior author Subburaj Karuppasamy, PhD, of the SUTD Medical Engineering and Design (MED) laboratory. "Accordingly, this work lays the foundation towards extracting valuable structural information from improved spine models, such as FSUs, in the diagnosis of osteoporosis and prediction of OVFs."

Computational prediction of failure load through numerical simulation, known popularly as FE analysis, is a non-invasive tool for examination of the spine, which also provides a holistic quantitative evaluation of bone strength. As the spine consists of many different spinal segments, it is essential to include these all load-bearing segments when considering the structural strength of spine. FSUs have the advantage of mimicking the biomechanical requirements of the spine better than each isolated vertebral segment.

Image: Finite analysis can help determine cervical bone strength (Photo courtesy of SUTD)

Reduction Guide Preserves Medial Column Function

An innovative reduction guide allows surgeons to place a beam precisely while maintaining adequate reduction along the medial column.

The Paragon 28 (Englewood, CO, USA; www.paragon28.com) Joust Beaming Screw System includes 5 mm, 5.5 mm, and 7.2 mm, solid and cannulated beams, all fully or partially threaded. The beams are made of type II anodized titanium (Ti-64AI-4V) for improved fatigue strength. All beams have a sharp tip for ease of insertion and are offered headless to minimize prominence. The 5 mm and 5.5 mm beams are offered in 50-120 mm for varying patient anatomies and to allow for increased bone capture. The 7.2 mm beams are available in 65-185 mm in length to allow surgeons to extend a medial column beam into the posterior aspect of the talus. The system offers partially threaded and fully threaded options to allow for compression or increased thread purchase, depending on the surgical requirements and patient anatomy. The Joust Beaming Screw System also includes the PRECISION Reduction Guide, which helps position the K–wire from the head of the first metatarsal to the talus, thus allowing a 2 mm thick Gorilla straddle plate to set the trajectory for a beam to pass through, without the hitting any on-axis plate screws and allowing reduced interoperative fluoroscopy time.

Bone plating is a method of fracture fixation in which one or more metal plates are applied across the fracture and anchored, usually by screws, into the fragments; the broken bones must first be surgically reset into their proper position. The method does have some drawbacks; after initially placing the plate on the break or fracture the bones are compressed together and held under some slight pressure, which helps to speed up the healing process of the bone. Unfortunately, the tension provided by the steel plate is lost after several days and the break or fracture is no longer under compression, slowing the healing process.

Mobile Lab Sterilizes Surgical Instruments on Site

A new all-electric mobile surgical instrument lab (eMSIL) will travel between UCLA Health (Los Angeles, CA, USA; www.uclahealth.org) hospitals to sterilize surgical instruments.

The eMSIL, built by Winnebago Industries (Forest City, IW, USA; www.winnebagoind.com), will travel between the UCLA Ronald Reagan and Santa Monica campuses to collect, clean, repair, disinfect, and sterilize surgical suite instruments. It includes all the equipment needed to deliver the same level of performance, productivity, and compliance (from decontamination through sterilization) as a lab located in a building. It also includes two desks in a slide-out area, two workbenches, an industrial sink, and two stations for 5.5 gallon ultrasonic cleaners, among other custom cabinetry and equipment.

The eMSIL is based on the standard Winnebago J33SE all-electric commercial shell platform, and is powered by an all-electric EPIC F-53 ten meter long chassis which was provided by Motiv Power Systems (Foster City, CA, USA; www.motivps.com). It is designed to hold enough battery charge for eight hours of typical service, on top of the round-trip travel to and from its home facility. The vehicle has already completed significant road testing, and can deliver an expected range of 135-200 kilometers on a full charge.

“The vehicle is expected to save UCLA Health Center close to USD 750,000 a year, as compared to contracting with a third-party to service surgical instruments off-site. That adds significant value to the system's bottom line," said Ashis Bhattacharya, VP of Business Development, Specialty Vehicles, and Advanced Technology at Winnebago Industries. “The mobile medical market is a growing industry, with countless applications, from cancer screenings and primary care to opioid treatment and dental services.”

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▶ April 2020

SAGES 2020 – Annual Meeting of the Society of American Gastrointestinal and Endoscopic Surgeons. Apr 1-4; Cleveland, OH, USA; Web: www.sages2020.org

WCO-IOF-ESCEO 2020 – World Congress on Osteoporosis, Osteoarthritis and Musculoskeletal Diseases. Apr 2-5; Barcelona, Spain: www.wco-iof-esceo.org

ISUOG 2020 – 16th International Symposium of International Society of Ultrasound in Obstetrics and Gynecology. Apr 3-5; Cairo, Egypt; Web: isuogsymposium2020.com

ICJR Middle East 2020 – 8th International Congress for Joint Reconstruction. Apr 4-6; Dubai, UAE; Web: www.icjrmiddleeast.com

ESTRO 39 – Annual Congress of the European Society of Radiology & Oncology. Apr 3-7; Vienna, Austria; Web: www.estro.org

ISBI 2020 – International Symposium on Biomedical Imaging. Apr 3-7; Iowa City, IA, USA; Web: 2020.biomedicalimaging.org

North Africa Health Expo 2020. Apr 7-9; Cairo, Egypt; Web: www.northafricahealthexpo.com

CMEF Spring 2020 – China International Medical Equipment Fair. Apr 9-12; Shanghai, China; Web: www.cmef.com.cn

79th Annual Meeting of the Japan Radiological Society (JRS). Apr 9-12; Yokohama, Japan; Web: www.radiology.jp

140th Annual Meeting of the American Surgical Association (ASA). Apr 16-18; Washington, DC, USA; Web: meeting.americansurgical.org

ISMRM 2020 – 28th Annual Meeting of the International Society for Magnetic Resonance in Medicine. Apr 18-23; Sydney, Australia; Web: www.ismrm.org

AAEM20 – 26th Annual Scientific Assembly of the American Academy of Emergency Medicine. Apr 19-23; Phoenix, AZ, USA; Web: www.aaem.org

SEACare 2020 – 23rd Southeast Asian Health-care & Pharma Show. Apr 20-23; Kuala Lumpur; Malaysia; Web: abcex.com

Charing Cross International Symposium 2020. Apr 21-24; London, United Kingdom; Web: www.cxsymposium.com

AAN 2020 – 72nd Annual Meeting of the American Academy of Neurology. Apr 25-May 1; Toronto, Canada; Web: www.aan.com

ESTES 2020 – 21st European Congress of Trauma & Emergency Surgery. Apr 26-28; Oslo, Norway; Web: www.estesonline.org

ECIO 2020 – European Conference on Interventional Oncology. Apr 26-29; Nice, France; Web: www.ecio.org

▶ May 2020

ARRS 2020 Annual Meeting – American Roentgen Ray Society. May 3-8; Chicago, IL, USA; Web: www.arrs.org

Vietnam Medi-Pharm 2020. May 6-9; Hanoi, Vietnam; Web: vietnammedipharm.vn

WCE 2020 – 14th World Congress on Endometriosis. May 8-11; Shanghai, China; Web: endometriosis.ca/world-congress/wce2020

SPR 2020 – Annual Meeting of the Society for Pediatric Radiology. May 9-15; Miami, FL, USA; Web: www.pedrad.org

ESO-WSO 2020 – Joint Conference of the European Stroke Organisation & World Stroke Organization. May 12-15; Vienna, Austria; Web: eso-wso-conference.org

ATS 2020 – International Conference of the American Thoracic Society. May 15-20; Philadelphia, PA, USA; Web: conference.thoracic.org

ACR 2020 – Annual Meeting of the American College of Radiology. May 16-20; Washington, DC, USA; Web: www.acr.org

ECO-ICO 2020 – European and International Congress on Obesity. May 17-20; Dublin, Ireland; Web: www.ecoico2020.com

ESGAR 2019 – 31st Annual Meeting of the European Society of Gastrointestinal and Abdominal Radiology. May 19-22; Amsterdam, The Netherlands; Web: www.esgar.org

Hospitalar 2020. May 19-22; Sao Paulo, Brazil; Web: www.hospitalar.com

Deutscher Röntgenkongress – 101st Annual Meeting of the German Roentgen Society. May 20-23; Leipzig, Germany; Web: www.drg.de

ECE 2020 – 22nd European Congress of Endocrinology. May 23-26; Prague, Czech Republic; Web: www.ese-hormones.org

6th Congress of the European Academy of Neurology (EAN). May 23-26; Paris, France; Web: www.ean.org/paris2020/

Africa Health 2020. May 26-28; Johannesburg, South Africa; Web: www.africahealthexhibition.com

EuroAnaesthesia 2020 – European Society of Anaesthesiology. May 30 – Jun 1; Barcelona, Spain; Web: www.esahq.org

▶ June 2020

88th EAS Congress – European Atherosclerosis Society. May 31-Jun 03; Geneva, Switzerland; Web: eas2020.com

ASNR 2020 – 58th Annual Meeting of the American Society of Neuroradiology. May 30 – Jun 4; Las Vegas, NV, USA; Web: www.asnr.org

ESPR 2020 – 56th Annual Meeting of the European Society of Paediatric Radiology. Jun 1-5; Marseille, France; Web: espr2020.org

57th ERA-EDTA Congress – European Renal Association – European Dialysis and Transplant Association. Jun 6-9; Milan, Italy; Web: www.era-edta.org

Asia Health 2020. June 10-12; Bangkok, Thailand; Web: www.medlabasia.com

EFORT 2020 – 21st Annual Congress of European Federation of National Associations of Orthopaedics and Traumatology. Jun 10-12; Vienna, Austria; Web: congress.efort.org

EUROSON 2020 – 32nd Congress of the European Federation of Societies for Ultrasound (EFSUMB). Jun 11-13; Bergen, Norway; Web: www.euroson2020.org

EHA25 – 25th Annual Congress of the European Hematology Association (EHA). Jun 11-14; Frankfurt, Germany; Web: ehaweb.org/congress

FIME 2020 – Florida International Medical Exhibition. Jun 23-25; Miami Beach, FL, USA; Web: www.fimeshow.com

SIIM 2020 – Annual Meeting of the Society for Imaging Informatics in Medicine. Jun 24-26; Austin, TX, USA; Web: siim.org

▶ July 2020

ESHRE 2020 – 36th Annual Meeting of the European Society of Human Reproduction and Embryology. Jul 5-8; Copenhagen, Denmark ; Web: www.eshre.eu

ECR 2019 – European Congress of Radiology. Jul 15-19; Vienna, Austria; Web: www.myesr.org

AOCR 2020 – 18th Asian Oceanian Congress of Radiology. Jul 23-26; Kuala Lumpur, Malaysia; Web: www.aocr2020.com

EADV 2020 – 29th Congress of the European Academy of Dermatology and Venereology. Jul 23-27; Vienna, Austria; Web: www.eadv.org

22nd MEDEXPO Africa 2020. Jul 25-27; Nairobi, Kenya; Web: www.expogr.com/kenyamed/

▶ August 2020

ESC Congress 2020 – European Society of Cardiology. Aug 29-Sep 2; Amsterdam, The

Netherlands: Web: www.escardio.org

▶ September 2020

ERS International Congress 2020 – European Respiratory Society. Sep 5-9; Vienna, Austria; Web: www.ersnet.org

ITC 2020 – 16th International Thyroid Conference. Sep 8-13; Xi'an; China; Web: www.itc2020.org

Medical Fair Asia 2020. Sep 9-11; Singapore; Web: www.medicalfair-asia.com

WCES 2020 – 17th World Congress of Endoscopic Surgery. Sep 9-12; Yokohama, Japan; Web: site2.convention.co.jp/wces2020

ESPE 2020 – 59th Annual Meeting of the European Society for Paediatric Endocrinology. Sep 10-12; Liverpool, United Kinngdom; Web: www.eurospe.org

CIRSE 2020 – Annual Congress of the Cardiovascular and Interventional Radiological Society of Europe. Sep 12-16; Munich, Germany; Web: www.cirse.org

ESRA 2020 – 39th Annual Congress of the European Society of Regional Anaesthesia and Pain Therapy. Sep 16-19; Thessaloniki, Greece; Web: esraeurope.org

ESMO 2020 – Annual Congress of the European Society for Medical Oncology. Sep 18-22; Madrid, Spain; Web: www.esmo.org

EUSEM 2020 – 14th European Emergency Medicine Congress. Sep 19-23; Copenhagen, Denmark; Web: www.eusemcongress.org

EASD 2020 – 56th Annual Meeting of the European Association for the Study of Diabetes. Sep 21-25; Vienna, Austria; Web: www.easd.org

ESVS 2020 – 34th Annual Meeting of the European Society for Vascular Surgery. Sep 29-Oct 2; Krakow, Poland; Web: www.esvs.org

▶ October 2020

90th Annual Meeting of the American Thyroid Association (ATA). Sep 29-Oct 3. Scottsdale, AZ, USA; Web: www.thyroid.org

ESMRMB 2020 – 37th Annual Meeting of the European Society for Magnetic Resonance in Medicine and Biology. Oct 1-3; Barcelona, Spain; Web: www.esmrmb.org

International Congress of Radiology 2020 – International Society of Radiology (ISR). Oct 1-4; Muscat, Oman; Web: www.isradiology.org

ICE 2020 – 19th International Congress of Endocrinology. Oct 4-7; Bueons Aires, Argentina; Web: ice-2020.com

EuGMS Congress 2020 – 16th International Congress of the European Geriatric Medicine Society. Oct 7-9; Athens, Greece; Web: www.eugms.org

ECISM LIVES 2020 – 33nd Annual Congress of European Society of Intensive Care Medicine. Oct 10-14; Madrid, Spain; Web: www.esicm.org

UEG Week 2020 – United European Gastroenterology. Oct 10-14; Amsterdam, The Netherlands; Web: www.ueg.eu

APSR 2020 – 25th Congress of the Asian Pacific Society of Respirology. Oct 15-18; Kyoto, Japan; Web: www.apsresp.org

EANM 2020 – 33rd Annual Congress of the European Association of Nuclear Medicine. Oct 17-21; Vienna, Austria; Web: www.eanm.org

30th ISUOG World Congress – International Society of Ultrasound in Obstetrics & Gynecology. Oct 13-16; Berlin, Germany; Web: www.isuog.org

▶ November 2020

Medica 2020. Nov 16-19; Dusseldorf, Germany; Web: www.medica-tradefair.com

RSNA 2020 – Annual Meeting of the Radiological Society of North America. Nov 27 – Dec 4; Chicago, IL, USA; Web: www.rsna.org

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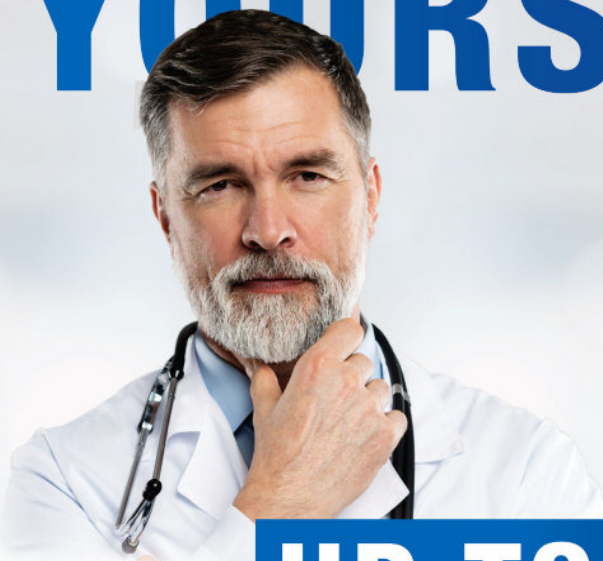

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