

Bubbles bring miracles to sick Ukrainian children

June 27, 2022

L'viv, Ukraine -- Miracles have been few and far between for Ukrainian children who are fleeing war zones while facing cancer and other life threatening diseases.

But tiny ultrasound microbubbles are now saving young lives and bringing hope to children like Nastya, a 15 year old girl from a small village near Kiev, who was evacuated to L'viv and had the good fortune to end up in the care of Dr. Viktor Zhelov, a pediatric radiologist at the Western Ukrainian Specialized Children's Medical Centre in L'viv, Ukraine.



Dr. Viktor Zhelov -Western Ukrainian Specialized Children's Medical Centre, L'viv, Ukraine

"This poor child was without parents, was in kidney failure and had a large mass on her right kidney that was suspect for cancer," Dr. Zhelov said.

Should Nastya be put on a list for a kidney transplant? Should she undergo chemotherapy? Will she survive?

Those questions and more depended on accurate diagnostic imaging, but conventional contrast computed tomography (CT) was not an option. For patients like Nastya, who have impaired kidneys, a contrast-CT exam is not feasible because of the potentially nephrotoxic nature of CT contrast agents. And expensive CT equipment is often unavailable or subject to long waiting lists, even during peaceful times.

Fortunately, ultrasound equipment was readily available at Dr. Zhelov's hospital, as it is in many medical centers around the world.

Dr. Zhelov, an expert in ultrasound imaging, knew that microbubble "contrast agents" are safely and routinely used worldwide to enhance ultrasound scans and identify abnormal microvascular blood flow patterns in real time – with images equivalent to those obtained by contrast CT.

Dr. Zhelov also is a member of the International Contrast Ultrasound Society (ICUS), a global nonprofit medical society that is dedicated to advancing the safe and appropriate use of contrast-enhanced ultrasound (CEUS) in order to improve patient care and save lives. ICUS galvanizes the global ultrasound "bubble community" – cardiologists, radiologists, sonographers, nurses and other physicians and imaging professionals. Membership in ICUS is free, and all ICUS educational programs and newsletters are offered free of charge to ICUS members in 60 countries.

Dr. Zhelov joined ICUS in 2017, when he first became aware of the benefits of CEUS for his patients.

Benefits of ultrasound microbubbles

CEUS is a non-invasive ultrasound-based diagnostic imaging tool that is safely and routinely used worldwide to help pinpoint and characterize cancers, diagnose heart and vascular disease, monitor chronic gastro-intestinal diseases, evaluate other serious medical conditions and monitor therapy.

During the CEUS exam, a biocompatible ultrasound contrast agent is injected into the patient's arm vein and conventional ultrasound equipment is used to scan the organ of interest, such as Nastya's kidney.

The ultrasound contrast agent is a liquid suspension of microscopic "bubbles" comprised of a lipid or albumin shell with a gas core. The microbubbles are smaller than red blood cells and flow unobstructed through the body's tiniest blood vessels. During transit, the gas core reflects ultrasound waves, producing images that represent blood flow patterns. Within minutes after the microbubbles are injected, the gas core is breathed out of the patient's body and the microbubbles are eliminated. Repeat CEUS examinations are feasible as needed, without waiting times.

Unlike contrast agents used for other forms of medical imaging, ultrasound contrast agents do not contain dye and create no known risk of kidney damage or deposit of contrast media in the brain. In addition, CEUS scans do not expose patients or hospital staff to ionizing radiation.

By improving the reliability of real-time ultrasound scans, these microbubble contrast agents often reduce the need for more expensive downstream tests, speed up the time to diagnosis and access to appropriate therapy, reduce the length of hospital stays, and improve patient care, outcomes and experiences.

"Ultrasound contrast agents have a strong safety record and offer an exquisite window into the patient in real time, while also reducing health care costs," said Dr. Dirk Clevert, a member of the ICUS board and professor of radiology who serves as Section Chief of the Interdisciplinary Ultrasound-Center at the University of Munich.

"There is no question that CEUS is a simple to use, powerful and indispensable diagnostic imaging tool that saves countless lives," added Dr. Fabio Piscaglia, an ICUS board member, and professor and director of the Unit of Internal Medicine at the University of Bologna.

Contrast-enhanced ultrasound (CEUS) "is a simple to use, powerful and indispensable diagnostic imaging tool that saves countless lives." -- Dr. Fabio Piscaglia

Although ultrasound microbubbles are predominantly used for imaging adults, "they offer a huge advantage for pediatric patients because they can completely eliminate radiation exposure associated with other forms of diagnostic imaging, avoid sedation or anesthesia, and depict pathology clearly and reliably," according to Dr. Kassa Darge, who also serves on the ICUS board and is a professor of radiology and Radiologist-in-Chief at Children's Hospital of Philadelphia (CHOP).

Ultrasound contrast agents "offer a huge advantage for pediatric patients because they can completely eliminate radiation exposure associated with other forms of diagnostic imaging, avoid sedation or anesthesia, and depict pathology clearly and reliably." - Dr. Kassa Darge

Dr. Darge said that the excellent safety profile of CEUS in children is now well established, based on scientific publications evaluating the use of microbubbles in thousands of children.

Four microbubble contrast agents are available in various countries around the world: Definity (Luminity in Europe), manufactured and sold by Lantheus Medical Imaging; Sonovue (Lumason in the USA), manufactured and sold by Bracco; and Optison and Sonazoid, manufactured and sold by GE Healthcare.

Influx of patients from all over Ukraine

As rockets blasted the outskirts of his city, Dr. Zhelov logged onto the ICUS website and asked the organization to help him obtain free vials of Sonovue, which is sold in many European countries and is the only ultrasound contrast agent approved for pediatric use.

“Due to the war in my country, we collect pediatric oncological patients from all over Ukraine,” Dr. Zhelov explained. His medical center is among the most prominent Ukrainian pediatric clinics in the fields of oncology, immunology and rare diseases.

Dr. Zhelov also told ICUS that CEUS may be the only practical modality for providing a reliable clinical diagnosis under the challenging circumstances facing children like Nastya.

“On behalf of our patients I’d like to ask you to help us,” he wrote.

Mobilization of “Bubble Community”

Within hours, ICUS, through its advisors at Dentons, a global law firm, reached the highest levels of leadership of Bracco, the Milan-based company that manufactures and sells Sonovue. The response to Dentons was quickly delivered in two words by CEO Fulvio Renoldi Bracco:

“Full support.”

In record time, Bracco’s medical, legal and supply chain departments mobilized and hundreds of vials found their way from Italy via Belgium and Poland to Dr. Zhelov in L’viv.

That was just the start.

ICUS also mobilized its own world-renowned CEUS experts to provide remote technical support for Dr. Zhelov and his colleagues.

Dr. Stephanie Wilson, Co-President of ICUS, immediately emailed Dr. Zhelov and offered guidance in scanning and using ultrasound contrast agents for oncology or other objectives. Dr. Wilson is a clinical professor of radiology and gastroenterology at the University of Calgary.

“Our hearts and best wishes are with you,” Dr. Wilson wrote, adding her “deepest admiration for your courage in such difficult times.”

Dr. Zhelov replied that he was surprised to hear from her. “I have followed all your available articles, webinars and presentations,” he wrote. “It’s hard to overestimate my respect and gratitude to you.”

Dr. Wilson’s colleague, Christine Merrill, a sonographer at the University of Calgary and member of the ICUS board, also provided remote advice to Dr. Zhelov.

Meanwhile, ICUS and Bracco identified the ultrasound equipment on site in L’viv, and Dr. Christian Greis and Luca Frazzoli, of Bracco, reached out to their contacts with the ultrasound vendors. Numerous

emails followed, offering additional technical guidance on optimal equipment settings and protocols for scanning children with the benefit of ultrasound contrast agents.

“The ICUS bubble community exists to do the right thing for patients throughout the world, and there can be no doubt that microbubble-based ultrasound contrast agents will improve care, change outcomes and save young lives entrusted to Dr. Zhelov,” according to Dr. Steven Feinstein, a cardiologist in Chicago and CEUS expert who, along with Dr. Wilson, is Co-President of ICUS.

“The ICUS bubble community exists to do the right thing for patients throughout the world, and there can be no doubt that microbubble-based ultrasound contrast agents will improve care, change outcomes and save young lives entrusted to Dr. Zhelov.” -- Dr. Steven Feinstein

Nastya receives her CEUS diagnosis

Armed with microbubbles and remote technical support, Dr. Zhelov then proceeded to examine Nastya.

Earlier imaging, without the benefit of ultrasound microbubbles, showed moderate hydronephrosis (swelling) of the left kidney and multicystic dysplasia of the right kidney. In addition, these earlier scans showed an incidental solid lesion on the right kidney.

Nastya was brought to the hospital’s ultrasound laboratory, where she received an arm vein injection of the microbubble contrast agent to reflect kidney blood flow patterns and help Dr. Zhelov determine whether the mass was malignant or benign.

“We performed CEUS without complication twice for both kidneys,” said Dr. Zhelov.

The result, for Nastya, was a miracle. CEUS showed that her kidney mass was merely a benign cyst – not cancer.

“Exclusion of cancer is one of the most important indications of CEUS,” according to Dr. Richard Barr, a professor of radiology at the Northeast Ohio Medical University and officer of ICUS.

Now, thanks to tiny microbubbles, Nastya will not receive unnecessary chemotherapy. Instead, she is scheduled for a kidney transplant -- and has the chance of leading an almost normal life.

“You give our children an additional chance to survive,” Dr. Zhelov said.

“You give our children an additional chance to survive.” -- Dr. Viktor Zhelov

With hope for more positive CEUS stories, Dr. Zhelov closed a recent email to ICUS by saying, “Ukrainians never give up and appreciate very much your help.”