

Contribution of diagnostic ultrasound systems to orthopedics



Hiroyuki Yokoi, MD, PhD
Director
Yokoi Health Care Sports Clinic
Osaka, Japan

Introduction

The use of diagnostic ultrasound systems in orthopedics has expanded to include not only diagnostic scans, but also a variety of ultrasound-guided procedures. In this report, we discussed the clinical usefulness of the ultrasound with Dr. Hiroyuki Yokoi, Director of Yokoi Health Care Sports Clinic where the ultrasound is actively used from diagnosis to treatment of various musculoskeletal conditions.

Collaborative care in sports medicine and Women's Health

Dr. Yokoi established the Yokoi Health Care Sports Clinic in Toyonaka-city, Osaka, Japan, in 2022, providing a wide range of healthcare services, especially for sports injuries and health wellness. In addition, the clinic provides collaborative care with adjoining Yokoi Ladies Clinic. "It is widely recognized that following childbirth and pregnancy women experience urinary incontinence and low back pain, even otherwise many conditions can contribute to low back pain in women including weight gain following pregnancy. In fact, some women may have difficulty in standing and walking due to back pain and pelvic discomfort. Antenatal and postnatal patients typically visit obstetricians and gynecologists, but musculoskeletal treatments are usually referred to orthopedic specialists. This discrepancy has created a barrier for patients to access healthcare services. One of our clinic's features is that we can support such patients as our clinic is located next to the obstetrics and gynecology clinic. Ultrasound

examination, which can avoid radiation exposure, is particularly beneficial for pregnant women who cannot undergo X-ray examination. As physicians, we provide not only assessment but also ultrasound-guided treatment such as hydrorelease and prolotherapy. The ultrasound systems are also effective for assessing the stability and mobility of the pelvic girdle in real time, and thus, physical therapists can conduct rehabilitation while monitoring the mobility of pelvic floor muscles and inner muscles."

The significance of ultrasound in orthopedics

Dr. Yokoi began using ultrasound systems when he was diagnosing sports injuries. "During my time in the hospital, I have found that ultrasound is useful to quickly diagnose these conditions in real time with dynamic movement of the patients' impacted regions because it is difficult to detect the pathologies associated with movement through MRI and/or MRI is also a time-consuming process. I can also perform repeat examination easily and follow up the patient's condition while carrying out the assessment, this made me more interested in ultrasound. When it comes to treatments, ultrasound helps in accurately targeting the treatment sites under visual guidance. Some papers even suggest that it is difficult to achieve an accurate approach to the target without ultrasound guidance. I can provide the appropriate medical care from evaluation, diagnosis to interventional procedures in one examination room using ultrasound. For these reasons, I believe the use of ultrasound is a patient-friendly and smart way."

Contributions of Aplio me to diagnosis and treatment in orthopedics

Yokoi Health Care Sports Clinic uses Canon's Aplio me ultrasound system for examinations to provide healthcare services. With regards to Aplio me, Dr. Yokoi states, "The image quality is significantly different from that of conventional systems. Aplio me is compact and easy to move around the hospital, so it's ideal for use in small clinics." He also mentioned the range of procedure is expanded with this system. "Since the introduction of Aplio me, we have started offering epidural block and nerve root block. When it comes to the spine, the conservative treatments such as oral medication and rehabilitation are common for clinical physicians after diagnosis. However, the high-resolution ultrasound system allows us to visualize areas that were unseen before, so we have more options for procedures and safer needle insertion to the area surrounding the spinal layers. Performing nerve root block and epidural block in outpatients safely allows us to make accurate diagnoses and expand treatment options, which has increased a trusting relationship with our patients. In addition, it is important for

patients to have a wide range of conservative treatment options available as a way to avoid surgery."

Dr. Yokoi uses linear transducers PLU-805BT and PLU-1204BT, and a convex transducer PVU-375BT in clinical practice. "Using the appropriate transducer is essential to obtaining clear images. I use different transducers depending on the procedure; for example, PLU-1204BT is useful for superficial structures that are within approximately 3 cm from the surface of the skin such as hands or ankle, and the new transducer of Aplio me, linear PLU-805BT, for femoral and lumbar areas that are 3 cm or deeper from the surface of the skin. I also use transducers with different widths. PLU-1204BT is approximately 4 cm in width, on the other hand, PLU-805BT is approximately 5 cm in width, which can provide wider images. This helps identify targets while viewing images on the screen, paying attention to higher-risk structures such as blood vessels and nerves. I actively use PLU-805BT in many cases, particularly for examinations of cervical nerve roots and nerve plexus. Visualizing not only the targeted nerve but also blood vessels and nerves surrounding the target in a single slice is really helpful to ensure safer procedures."

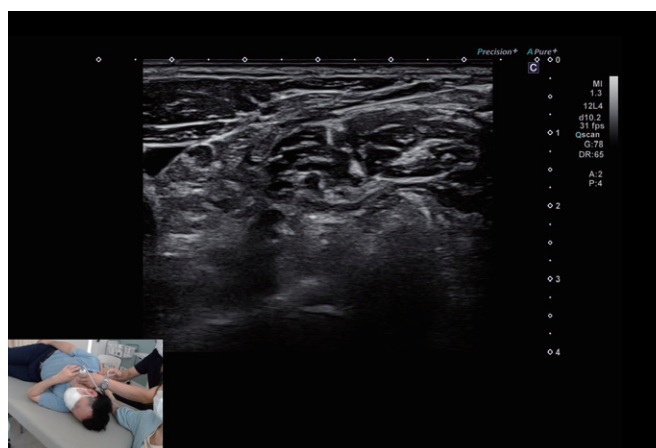


Figure 1 Deep cervical plexus block (PLU-805BT)



Figure 2 Tendon sheath injection (PLU-1204BT)

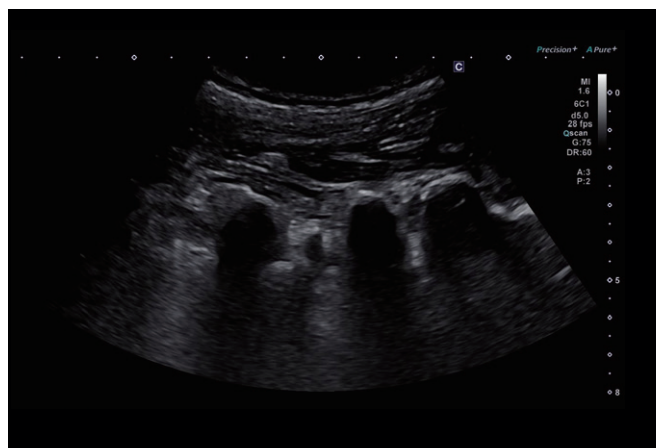


Figure 3 Lumbar nerve root block (PVU-375BT)



Linear transducer PLU-805BT



Linear transducer PLU-1204BT



Convex transducer PVU-375BT

The utility of SMI

Among the various applications available on the Aplio me, Dr. Yokoi uses Superb Micro-vascular Imaging (SMI), which is a technology for visualizing low-velocity blood flow. "SMI is a very useful tool. When checking the movement of the fluid, SMI has less motion artifacts, which allow me to view generally where the fluid is entering, whereas color Doppler is prone to

motion artifacts overall. Moreover, SMI can visualize the needle tip of the injection, making it useful to confirm the precise needle position." Dr. Yokoi also said that it was helpful to facilitate communication with patients. "For example, I can explain by showing images with SMI, "There is this amount of inflammation, so I'm going to give the injection here." If the fluid is accurately injected into the target, the patients' outcomes will be improved, increasing their satisfaction."

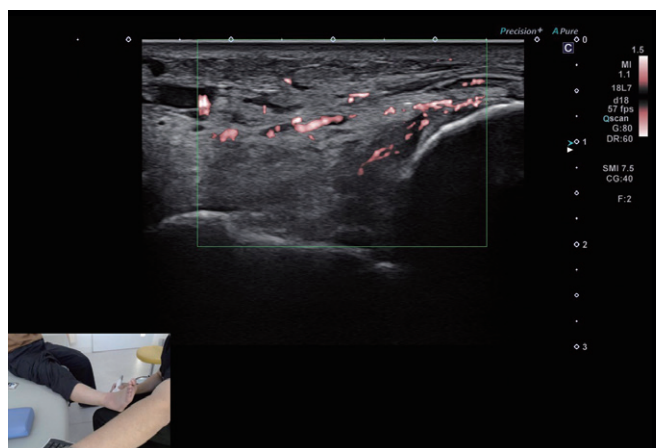


Figure 4 Observation of deltoid ligament injuries with SMI

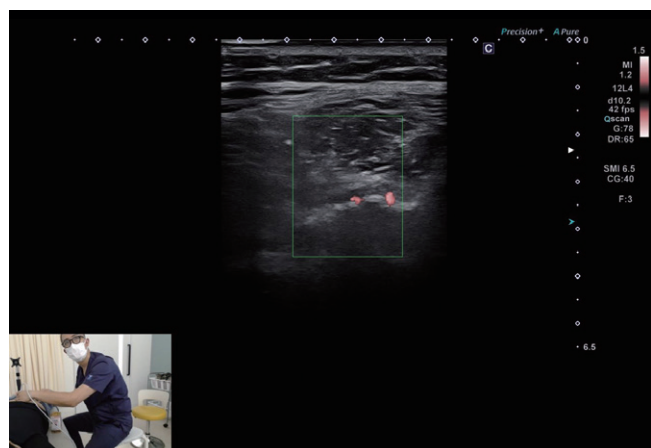


Figure 5 SMI image of facet injection



To achieve high satisfaction in outpatient

The clinic installed a second monitor to share the images with a patient in real time during the treatment. "I installed the monitors at both ends of the bed, allowing the patient to see the same images as they are lying down while a physician performs the injection, which helps to build a mutual bond between the patient and the physician. Moreover, the physician can save time on the setup of the system because additional positioning is not required for each injection, and we can perform injections while viewing the image on the monitor that is easier to see. Aplio me is

really useful as we can now introduce the cart-based system even in limited space for outpatient care." ApliCam has also been introduced in this clinic. ApliCam has the feature of saving ultrasound images with video images captured by a camera. "This function is essential because ApliCam is very helpful when it may be difficult to distinguish left from right and recognize details about body parts when reviewing cases later. Moreover, the sub-monitor displays actual injection being performed, so a patient can see the procedure being performed in an area the patient cannot see. This is also useful as it provides a friendly understanding when giving a presentation at conferences."



Figure 6 Providing explanation while showing the images on the second monitor to a patient

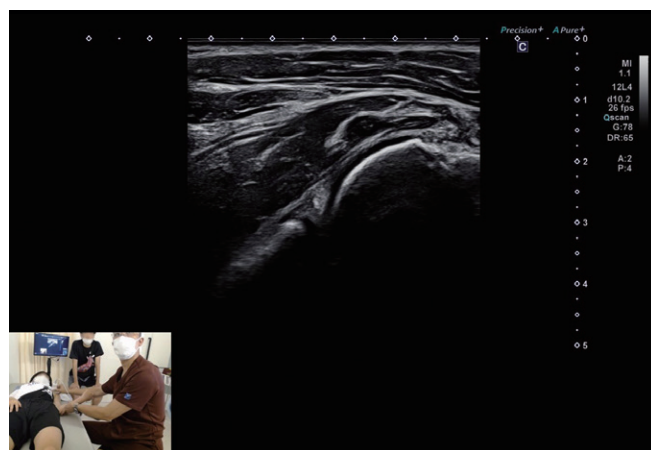


Figure 7 Viewing superior labrum anterior to posterior



The value of using ultrasound in clinics

Dr. Yokoi gave us a message about the value of using ultrasound for self-employed physicians. "With the use of ultrasound, the range of medical services can be expanded. Physicians can perform procedures and share the expectations with their patients while simultaneously viewing the same images. This results in increasing patient

satisfaction. When performing ultrasound-guided injections, patients often say, 'I've never seen this before' or ask, 'Is this where the fluid is going?' Now, they can see the procedure as it happens, which deepens their understanding of the treatments and leads to develop a mutual trust with patients. Aplio me is appropriate especially for self-employed physicians, and I would strongly recommend it to physicians who can operate ultrasound systems."



CANON MEDICAL SYSTEMS CORPORATION

<https://global.medical.canon>

©Canon Medical Systems Corporation 2025. All rights reserved.
Design and specifications are subject to change without notice.
Model number: CUS-AME00
MOIUS0147EA 2025-03 CMSC/Produced in Japan

Canon Medical Systems Corporation meets internationally recognized standards for Quality Management System ISO 9001, ISO 13485. Canon Medical Systems Corporation meets the Environmental Management System standard ISO 14001.

This document may include trademarks or registered trademarks of their respective owners.

The clinical results described in this paper are the experience of the author.
Results may vary due to clinical setting, patient presentation and other factors.

The purpose of this paper is to provide medical information related to imaging technology using our system to healthcare professionals. Please note that this is not intended to provide information to the general public.

Made For life