

New perspectives in sports imaging



Dr. Iñigo Iriarte
Rehabilitation specialist
Ars Médica
Bilbao, Spain

Introduction

All imaging modalities are involved in sports medicine, particularly ultrasound and MRI for the investigation of musculoskeletal (MSK) imaging, and advanced CT for cardiac imaging. Over many years, Canon has provided increasingly high-quality imaging in all modalities for diagnostics and treatment in sports medicine through continual development of its technologies and expertise. One of the world's leading experts in the field, Dr. Iñigo Iriarte, explains how advances in MSK imaging enable better diagnoses and more effective treatment.

Sports medicine – A key to future innovation

Canon has a carefully constructed sports medicine strategy and years of experience in this field. We believe that expertise in elite sports medicine will unlock future innovations and knowledge to widen clinical diagnosis and treatment for all. We work with many well-known elite sporting organizations, such as premier football clubs - Manchester United Football Club, FC Barcelona and Real Madrid C.F. However, it is not just about the highest levels of sport. Many of our imaging systems and technologies are being used at a local, national and international levels in, for example, tennis, basketball, rugby and cycling.

What all these sports partnerships have in common is the aim to push the boundaries of anatomical and physiological understanding of the human body and investigate how it functions under pressure from various types of sport or high exertion. The process of learning at the top echelon of sport has some potential for translation to the general public. Our

partnerships can assist with developing population-screening programs, earlier prevention diagnosis confidence in hospitals and clinics, or detailed treatment planning.

Shaping the future in sports medicine

Dr. Iñigo Iriarte is one of the world's top experts in MSK imaging and rehabilitation of athletes, collaborates regularly with Canon. He is an author of one of the most comprehensive anatomical and diagnostic books available for best MSK ultrasound, textbooks ever published: "Ultrasound of the Musculoskeletal System: Anatomical Exploration and Pathology" Mskroom Books, 2021, as well as many scientific research papers. Dr. Iriarte has worked as an Orthopedic Rehabilitation Consultant at Ars Médica in Bilbao, Spain, since 2000. He has been Professor of the Board of MSK ultrasound of the Spanish Society of Rehabilitation (SERMEF) since 2014; a lecturer in several courses in MSK and US guided procedures in Spain; Book Editor of *Ecografía Musculo-esquelética. Atlas Ilustrado*. Ed. Panamericana 2015; and he has served as a Consultant to Athletic de Bilbao F.C. Medical Services since 2018.

MSK sports injuries are most frequently assessed by using MRI and ultrasound. The key questions are: What are the advantages of each? How do ultrasound and MR best complement each other? And how does the clinician choose the right tool at the right time?

"MRI is the gold standard. It is more sensitive and more specific, but it is also more expensive, and is not always available," remarked Dr. Iriarte. "So, the clinician must choose the balance between these two techniques."



“Through higher-quality imaging, we now have a better understanding of sports’ injuries, even small ones. We can make a more precise diagnosis, and we can better understand the evolution of the athlete’s injury and implement a better treatment to return to sports safely.”

First assessment

“We usually use ultrasound at the first assessment at the point of care, which is when the patient or the player, has been injured,” he continued. “In professional players, we need more information. We need to be sure. So, we usually perform an MRI in professional players.”

“In amateur players, it depends on the injury that we have diagnosed with ultrasound. If it is something difficult to assess with ultrasound, like, for example, hamstring tendons or a common tendon in the rectus femoris, other deep structures, or when we have doubts and we need an accurate diagnosis, we use MRI,” he said.

Healing process

For monitoring and control of the recovery and healing process, Dr. Iriarte usually uses ultrasound, mostly because of its availability.

“If everything goes well, we do not perform other imaging techniques, only ultrasound. And if the injury is severe, or we need to perform an early return to play and we are not very sure about the injury, sometimes we ask for a second MRI, but not usually,” he said. “It depends on the injury and the patient.”

New possibilities with higher resolution ultrasound

Due to advances in image quality in ultrasound, there is an expansion of its use to look at nerves, nerve damage, and blood vessels in MSK. It also offers a non-invasive way to examine muscles and nerves in great detail that does not involve radiation.

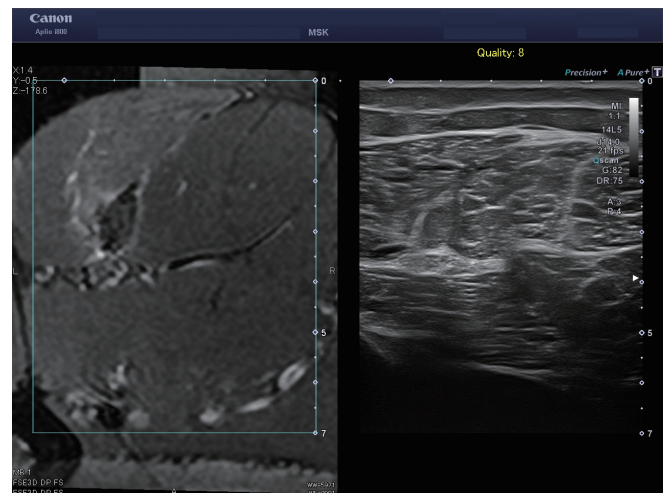
“With high-resolution now achievable, we can see very, very, small structures of one millimeter or less. So, we can assess structures that we couldn’t before. We can even see terminal branches of the nerves,” he said.

“Ultrasound, for me, is the best imaging tool to assess nerves because you can follow the whole path of the nerve — from its origin until its end. It’s a unique technique which allows you to do that,” he continued. “You can interact with the patient to confirm exactly where the problem is, and you can perform dynamic maneuvers to assess if the nerve is compromised in some areas. This conjunction between the clinical interaction with the patient and the possibility of assessing all of the nerve is very important. No other technique has these particularities. So, for me the best technique to assess nerves — if we are talking about image — is ultrasound. With it, we can see almost all the nerves in the body.”

Multi-modality imaging fusion

Fusion, in which ultrasound images can be overlaid onto MRI images, is a possibility for sports medicine.

"Fusion is a very interesting tool," remarked Dr. Iriarte. "However, at the moment, we don't use it enough, because you need some special MRI techniques, which need more time to acquire the images and it's not always possible in our system. I really want to use fusion though. It is very interesting for learning and for teaching because you can compare ultrasound with the MRI images in real-time and learn a lot from this comparison."



Small edema in the myoconnective junction between biceps femoris and common tendon (left). Evolution of the scar at the common tendon in a tendinous injury (right).



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Futurescape

Dr. Iriarte also sees the use of artificial intelligence (AI) in ultrasound in particular, a very interesting tool for the future.

“At the moment, it is a little difficult to realize well, because AI needs deep learning — thousands and thousands of images, as exact as possible, as reproducible as possible — to recognize different patterns,” he explained.

“So, in ultrasound this is very difficult, because the technique is not the final images you have in your report. It’s about videos, it’s about talking with the patient, it’s about your impression, your subjective impressions about the scan. And at the end, you take the pictures, trying to summarize all of this information for anyone who is reading your report.”

As a pioneer in sports medicine, Dr. Iriarte will continue to collaborate closely with Canon in the future. The advances made in imaging embodied in Canon’s Aplio i800 for example, have already enabled several studies by Dr. Iriarte.

Find out more about the work of Dr. Iñigo Iriarte:

<https://www.youtube.com/c/inigoiri>

<https://mskroom.com/books.php>

Find out more about Canon Medical’s commitment to sports imaging:

<https://global.medical.canon/specialties/sportsmed>

<https://global.medical.canon/products/ultrasound>



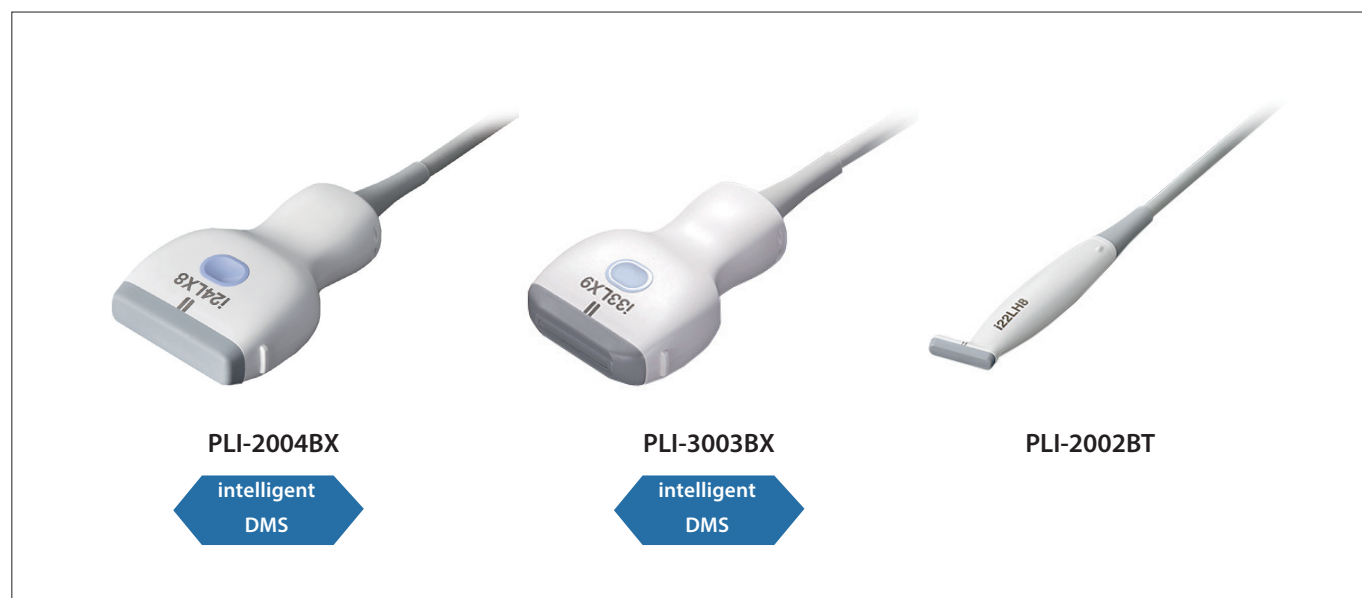
Canon's Aplio i-series / Prism Edition – Outstanding for sports imaging

Our Aplio i-series ultrasound system is designed to provide a complete host of MSK imaging and quantification capabilities for high-quality diagnostics, outstanding versatility and exceptional ease of use.

- High quality, robust image quality for a wide range of patients
- Customizable user interface with advanced workflow navigation capability
- Automated measurements for fast and easy workflow
- High-frequency transducer

High-frequency transducer

Aplio i-series offers a collection of high-frequency transducers. The Canon-developed low attenuation lens, high performance piezoelectric oscillator and optimized matching layer and backing form the foundation for high-frequency emission. The elevated frequency range expands the horizon for clinical applications especially for small parts, MSK and other potential clinical regions such as dermatology.



High-frequency transducers PLI-2004BX and PLI-3003BX equipped with intelligent Dynamic Micro-Slice (iDMS) technology deliver crystal-clear images with excellent contrast and spatial resolution. The hockeystick transducer PLI-2002BT offers extraordinary image quality and its small footprint and ergonomic design provide flexibility in use.



Canon's Vantage Galan 3T MRI – Advanced imaging for extra detail

The Vantage Galan 3T features Advanced intelligent Clear-IQ Engine (AiCE), in combination with the Compressed SPEEDER. This MRI not only produces stunningly crisp and beautiful images, the combination of intelligent AI, Parallel Imaging and Compressed sensing means whole body images can be captured quickly and efficiently. It enables you to tackle the most complex procedures with automated slice alignment and rapid scan technology, and our unique AI to remove noise and improve SNR1 and assist in diagnostic decision-making.

Advanced intelligent Clear-IQ Engine (AiCE)

Canon's AiCE is an innovative Deep Learning Reconstruction technology that's been trained to reduce noise and boost signal to deliver sharp, clear and distinct images at speed.

AiCE images have:

- Low Noise
- Natural Image Texture*
- Sharp High Contrast Resolution
- Clear Low Contrast Detectability



*Compared to MBIR

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Results may vary due to clinical setting, patient presentation and other factors.

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