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Interview on Sports Imaging
Bulgaria / Dr. Elena Ilieva

Given the potential ramifications of a missed or inaccurate diagnosis on the career of a professional athlete, dedicated training on the part of the MSK radiologist is of utmost importance, especially in countries lacking emphasis on the subspecialty, says Dr. Elena Ilieva.

European Society of Radiology: *Sports imaging is the main theme of IDoR 2019. In most countries, this is not a specialty in itself, but a focus within musculoskeletal radiology. In your country, is there a special focus on sports imaging within radiology training or special courses for interested radiologists?*
Elena Ilieva: MSK radiology is not yet recognised as a subspecialty in our country. Our training in general radiology includes MSK rotation, which also covers sports imaging. Over the last few years, interest in sports-related imaging has been gradually increasing. Special courses on the topic are organised, some of which are interdisciplinary, together with traumatologists and orthopaedic surgeons.

ESR: *Please describe your regular working environment (hospital, private practice). Does sports-related imaging take up all, most, or only part of your regular work schedule?*
EI: Working in an emergency hospital connects us with a large spectrum of surgical and non-surgical emergencies including MSK emergencies. We provide imaging with various modalities, radiography, ultrasound, CT and interventional procedures, around the clock. The environment is stressful but good collaboration with the other departments has been established. Sports-related imaging is just a part of the everyday workflow.

ESR: *Based on your experience, which sports produce the most injuries that require medical imaging? Have you seen any changes in this regard during your career? What areas/types of injuries provide the greatest challenge to radiologists?*
EI: Any sport involving extensive or repetitive motion can lead to injury with football, skiing, basketball, volleyball, bicycling, wrestling and tennis being the most common source of trauma that requires imaging. Nowadays, the age of patients with sports injuries has trended downward. Chronic injury is the major sports injury of older athletes, while acute injury is the major sports injury for relatively young players. One of the main challenges in sports imaging is the assessment of return to play in cases of higher-grade muscle injuries.

ESR: *Please give a detailed overview of the sports injuries with which you are most familiar and their respective modalities.*
EI: Muscle injury is the most common sports-related trauma with ultrasound being the first imaging modality to identify pathology in easily accessible areas and MRI used as the next imaging technique for

differentiating and adequate grading of acute, subacute and chronic muscle abnormalities. When fractures or dislocations are suspected, radiography is the modality of choice. CT is preferred when more precise information is needed before or after operation. In cases of combination with injury of ligaments, tendons or muscles, MRI is the significantly superior imaging method. For tendon or ligament injury, either acute or chronic, MRI is more accurate in identifying the pathology. Ultrasound could be the preferred method when MRI cannot be performed or when dynamic assessment is necessary.

ESR: *What diseases associated with sporting activity can be detected with imaging? Can you provide examples?*
EI: Injuries to the muscles, bones, and joints of athletes, adolescents and adults, are extremely common and may be responsible for prolonged periods of competitive inactivity. Beyond fractures and dislocation which require x-ray or CT, many sports-related MSK disorders encountered require MRI. Some examples of injuries include shoulder impingement in volleyball players and weightlifters; tennis or golfer's elbow; hamstring injury in football players, sprinters and jumpers, ACL and accompanying injuries in skiers; and plantar fasciitis in dancers and gymnasts.

ESR: *Radiologists are part of a team; for sports imaging this likely consists of surgeons, orthopaedists, cardiologists and/or neurologists. How would you define the role of the radiologist within this team and how would you describe the cooperation between radiologists, surgeons, and other physicians?*
EI: The role of the radiologist in the multidisciplinary sports-related injury team is pivotal. By working closely together, physicians and radiologists can significantly improve the clinical management of sporting injuries and thus aid with prognosis in elite athletes and enhance the performance and health of all exercising individuals. In addition, close collaboration can reduce harm to patients from diagnostic error, reduce costs from inappropriate or non-beneficial tests or treatments being initiated as a result of misinformation, and standardise care delivery through real-time peer review of decision-making.

ESR: *The role of the radiologist in determining diagnoses with sports imaging is obvious; how much involvement is there regarding treatment and follow-up?*
EI: The radiologist's role in the management of injuries of both the elite professional and amateur athlete has evolved from simple diagnostic imaging, to image guided interventions and prognostication of injury return-to-play times. The main aim of image guided interventions is to speed-up the recovery phase. The most common procedures performed under ultrasound guidance either by radiologists or in collaboration with orthopaedic surgeons are evacuation of a liquefying haematoma or injections of corticosteroids, platelet rich plasma, hyaluronic acid, etc.; for muscle injury, cartilage damage or chronic ligament/tendon injury.

ESR: *Radiology is effective in identifying and treating sports-related injuries and diseases, but can it also be used to prevent them? Can the information provided by medical imaging be used to enhance the performance of athletes?*
EI: Imaging is crucial to confirm and assess the extent of sports-related injuries and may help to guide management, which directly affects prognosis. This is especially important when the diagnosis or grade of injury is unclear, when recovery is taking longer than expected, and when interventional or surgical management may be necessary. Currently the most frequently applied imaging techniques in sports medicine are ultrasonography and magnetic resonance imaging. However, can imaging predict injury or re-injury? My impression is that this will happen, but more research is needed.

ESR: *Many elite sports centres use cutting-edge medical imaging equipment and attract talented radiologists to operate it. Are you involved with such centres? How can the knowledge acquired in this setting be used to benefit all patients?*
EI: Working as part of the medical team in a specialised sport centre adds a lot to my knowledge of sports-related injuries and

benefits other patients as well by providing a more confident diagnosis, as well as by reducing scan times and improving the quality of imaging.

ESR: *The demand for imaging studies has been rising steadily over the past decades, placing strain on healthcare budgets. Has the demand also increased in sports medicine? What can be done to better justify imaging requests and make the most of available resources?*
EI: In the last several years, new imaging centres have been established, either independent or as part of private hospitals, trying to answer to the increased demand for better imaging. It is important that imaging requests include a specific clinical question to answer and contain sufficient information about the clinical history, physical examination and relevant additional investigations to support the suspected diagnosis.

ESR: *Athletes are more prone to injuries that require medical imaging. How much greater is their risk of developing diseases related to frequent exposure to radiation and what can be done to limit the negative impacts from overexposure?*
EI: Theoretically, the risk is higher due to more frequent exposure to radiation. Decreasing this risk calls for implementing up-to-date digital radiography systems, optimising studies to obtain quality images at low radiation doses, avoiding inappropriate use of imaging, and considering alternative imaging. Overall, clinicians should have an increased awareness of the problem and prevent unnecessary health risks when possible. We should all remember to first "do no harm."

ESR: *Do you actively practise sports yourself and if yes, does this help you in your daily work as MSK radiologist?*
EI: I try to visit my favourite dancing classes or ride my bicycle as often as possible. That is my way of staying fit and in good condition for work.

A note on the importance of accurate and effective sports imaging
EI: Accurate imaging of athletes with sports injuries is essential. The information gained from imaging can be helpful in making a diagnosis, determining the severity of an injury, and guiding therapy. The consequences of missing a diagnosis could possibly end an athlete's career. To play a useful role in the diagnosis and therapy of athletic injuries, it is important for the imager to be familiar with normal musculoskeletal anatomy and the pitfalls, as well as the common and uncommon imaging characteristics of different traumatic entities. For that reason, diagnostic skills in musculoskeletal imaging including sports imaging should be improved with dedicated training in the field, especially in countries where MSK imaging is not a separate subspecialty.

Dr. Elena Ilieva is a general radiologist subspecialising in MSK radiology, and works at the department of diagnostic imaging at the Emergency University Hospital 'Pirogov' as well as a consultant in a private MRI centre in Sofia, Bulgaria. She trained in general radiology in Sofia and underwent a fellowship in MSK radiology in Case Western Reserve University, Cleveland, Ohio. She is author and co-author of many publications, as well as lecturer at national and international congresses, tutorials and refresher courses. She has won several national and international awards. She is an active member of the Bulgarian Radiology Association, European Society of Musculoskeletal Radiology and the European Society of Radiology.