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## Interview on Sports Imaging Canada / Dr. Bruce Forster

### Radiologists hold potential to act as team leaders in care of athletes, says Dr. Bruce Forster.

**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?

**Bruce Forster:** Yes, there are a number of radiology fellowships across Canada that specialise in sports imaging, emphasising MRI and ultrasound (US) in particular, but also imaging guided injection for diagnosis and treatment. We have two such fellowships at the University of British Columbia (UBC). Additionally, there are several CME (continuing medical education) courses that emphasise sports imaging, including the University of Toronto/UBC collaborative course, 'Whistler MSK'.

**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?

**BF:** I work in three main locations: a busy urban quaternary centre, a smaller urban hospital and a clinic. In all three, sports imaging is a major focus, but especially in the latter two.

**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?

**BF:** I was Head of Medical Imaging for the Vancouver 2010 Olympic/Paralympic Games and have also worked extensively to support elite and professional athletes in winter and summer sports. Winter sports such as downhill skiing have a high prevalence of knee and shoulder injuries. Ice hockey, a prevalent sport in Canada, is often linked to ankle injuries, including high ankle sprains and groin injuries. Sliding sports such as luge, skeleton racing and bobsleigh, which involve track speeds of 120–140 km/h, can have multisystem injuries not unlike those seen in road traffic accidents. Vancouver has a vibrant elite amateur baseball programme and shoulder/elbow injuries are particularly common there. Tennis, a sport that also places emphasis and strain on the arms, has a similar injury pattern.

**ESR:** Please give a detailed overview of the sports injuries with which you are most familiar and their respective modalities.

**BF:**  
ACL/meniscal injuries: MRI  
Shoulder instability: MR arthrography  
UCL elbow injuries: US and MRI  
Hip labral tears: MR arthrography  
Common extensor and flexor elbow tendinopathies (Golf/tennis): US  
ECU injuries (golf): US

Achilles tendinopathy/ruptures (squash/tennis): US and MRI  
Patellar tendinopathy: US/MRI  
Ankle osteochondral injuries: CT/MRI  
Stress fractures: MRI/CT

**ESR:** *What diseases associated with sporting activity can be detected with imaging? Can you provide examples?*

**BF:** Generally, we can detect most bone-related pathology, including fractures, with plain radiographs and CT. Tendinous and ligament injuries are best imaged with US and MRI, and chondral injuries with MRI. Overuse injuries are very common, especially in middle-aged and older athletes. Cervical and lumbar radiculopathy are also very common and best evaluated with MRI.

**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?*

**BF:** My experience in the Olympics and otherwise has led me to consider radiologists as potential team leaders in the care of an athlete. I have written an editorial about this as Guest Editor of a sports imaging series in *Radiology* titled 'Sports Imaging: Radiologists as Team Leaders in Care of the Athlete'<sup>1</sup>. The team also includes sports medicine physicians, physiotherapists, occupational therapists, kinesiologists, chiropractors, and importantly, imaging technologists.

**ESR:** *The role of the radiologist in determining diagnoses with sports imaging is obvious; how much involvement is there regarding treatment and follow-up?*

**BF:** Follow-up is a promising area for sports imaging, especially in the context of return to play (RTP) after an injury. There has been a lot of research in this regard, but it is fair to say that we have a long way to go until we can accurately predict when it is safe for an athlete to return to their sport with the confidence that they will not re-injure themselves while performing near pre-injury levels. This is an exciting, developing area in patient care, and artificial

intelligence in analysis of large data bases may prove beneficial<sup>2</sup>. Regarding post-treatment, we routinely image patients with ongoing symptoms after conservative or surgical treatment, and play a role in determining if there is residual or recurrent injury.

**ESR:** *Radiology is effective in identifying and treating sports-related injuries and diseases, but can it also be used to pre-empt them? Can the information provided by medical imaging be used to enhance the performance of athletes?*

**BF:** I do not think there is any data to indicate this. Professional athletes are strictly regulated regarding performance enhancement. Perhaps one day the use of AI may allow for the prevention of injuries. One exception may be the evaluation of athletes who have stingers. CT or MR of the cervical spine can identify athletes with narrow spinal canals and suggest that they may want to avoid contact sports such as rugby or American football.

**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?*

**BF:** We perform advanced cartilage mapping with MRI to detect damage before symptoms occur and before morphologic changes on MRI are visible. However, the role that such studies play in clinical management is not yet clear.

**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?*

**BF:** Demand has absolutely increased and there is data from USA Medicare to support this. Certainly, advocacy regarding the healthcare burden that for example osteoarthritis represents is critical. Such points are often overlooked when important and impactful diseases such as cancer and heart disease are considered. Also, implementation of appropriateness

guidelines supported by the radiology community, such as the ACR (American College of Radiology), are critical. Imaging the right patient at the right time with the right test is important, if a test is needed at all. We have written five editorials regarding imaging appropriateness in sports medicine for the British Journal of Sports Medicine.

**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?*

**BF:** It is key to perform imaging only when necessary, and with the right test. This is especially true in avoiding unnecessary radiation in the paediatric and young adult population, especially with respect to CT<sup>3</sup>.

**ESR:** *Do you actively practise sports yourself and if yes, does this help you in your daily work as a MSK radiologist?*

**BF:** Yes, I play golf, downhill ski, cycle, and hike. It certainly reminds me about overuse! However, I don't think one needs to play the sport to understand it. In order to be an effective member of the team, radiologists need to understand the biomechanics and specific risks of the sport. Our sports medicine colleagues can be very helpful in this education.

**European Society of Radiology:** Sports imaging also applies to sports-related injuries of the brain. In case you are familiar with this, please also answer the following questions:

**ESR:** *Which sports have the highest risk of inducing brain injuries?*

**BF:** Sports with heavy physical contact including American football, rugby, Australian rules football, ice hockey, and to some extent soccer (heading the ball) all have a high risk of inducing brain injury. Wearing a helmet in sports such as downhill skiing can reduce this risk. Knowledge of how to manage a concussion, especially with respect to RTP by our clinical colleagues, is essential.

**ESR:** *What imaging modalities do you use with traumatic brain injury specifically in athletes?*

**BF:** Most studies except for those with severe/penetrating trauma are negative. This includes CT and MRI, but these are often performed to exclude intracranial haemorrhage or contusion. Certain MRI sequences that are sensitive to micro-bleeds, such as susceptibility weighted imaging (SWI) are helpful. In general, imaging is disappointingly insensitive in the detection of abnormalities in patients with concussion.

**ESR:** *What can be learned from sports-related injuries that can be applied to a broader use, for example those sustained through automobile or other accidents that cause traumatic brain injury?*

**BF:** All research in traumatic brain injury could be potentially valuable in understanding the pathophysiology in athletes.

**ESR:** *How have advances in brain imaging allowed you to predict patient outcomes more accurately?*

**BF:** We are not there yet, at all. Even advanced techniques such as MR spectroscopy have been disappointing in predicting outcomes.

**ESR:** *Please feel free to add any information and thoughts on this topic you would like to share.*

**BF:** Image-guided injection can be beneficial to patients but is also controversial with substances such as PRP (platelet-rich plasma). I do not perform such procedures, but this would be an interesting area to explore.

<sup>1</sup> Sports Imaging: Radiologists as Team Leaders in Care of the Athlete. Radiology 2016, Feb; 278(2): 313-4

<sup>2</sup> Forster et al. Artificial intelligence in sports medicine radiology: what's coming? Br J Sports Med. 2018 Nov 22. Epub ahead of print

<sup>3</sup> Forster BB. The game has changed... but it still needs to be played: the role of imaging tests using ionising radiation in the practice of sports medicine. Br J Sports Med. 2014 Apr;48(8):679.



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**Dr. Bruce Forster** is Professor and Head at the University of British Columbia, Department of Radiology, and Director of the UBC, Office of Academic Innovation. He was recently the Regional Department Head and Medical Director, Diagnostic Imaging, Vancouver Coastal Health and Providence Health Care and Director of Diagnostic Imaging for the Vancouver 2010 Winter Olympics/Paralympics Games. As an Associate Member of the Allan McGavin Sports Medicine Centre, he has been involved in the clinical, education, and research aspects of sports imaging for over 25 years. Dr. Forster has delivered over 350 invited lectures, many internationally, and has served as a Visiting Professor in Canada, the United States, Indonesia, Singapore, Japan, South America, Russia, and the Middle East. He is the author of over 135 peer-reviewed scientific publications, and 120 educational exhibits, and has served as President of the Pacific Northwest Radiology Society, the Board of Directors of the Canadian Association of Radiologists, and is currently on the Board of Directors and is President of the Canadian Radiologic Foundation. Dr. Forster was Lead Physician for 'Choosing Wisely Medical Imaging' one of the most comprehensive appropriateness initiatives in the Province.

