Spotlight: Sanjay Sharma, BSc, MD, FRCP, FESC

“Our Studies Have Comprehensively Characterised the Spectrum of Electrical and Structural Changes in Black Athletes, and Our Data Are Beginning to Inform Major Guidelines in Sports Cardiology”


Sanjay Sharma, BSc, MD, FRCP, FESC, is professor of inherited cardiac diseases and sports cardiology and a consultant cardiologist at St. George’s Healthcare NHS Trust, London, England; medical director of the London Marathon; and lead cardiologist for the London 2012 Olympics. He also provides cardiological advice to the British Lawn Tennis Association, the British Football Association, the British Premier Rugby Union and League, the English Institute of Sport, which is responsible for the welfare of all national athletes competing in Commonwealth and Olympic events, and the charity Cardiac Risk in the Young (CRY). None of Professor Sharma’s roles outside his post of professor of cardiology is remunerated financially, but he says, “I spend a lot of my professional time with endurance athletes, and I am familiar with the medical problems they may encounter. Sudden cardiac death is the most feared complication, so being a cardiologist is a real help for runners who have concerning symptoms and signs.”

Demonstrating That Physiological Right Ventricular Enlargement Is Common in Both Black and White Athletes and the Impact of Ethnicity Is Minimal

Professor Sharma’s particular interest is cardiomyopathies, which are often implicated in sudden deaths in young exercising individuals. His research has predominantly involved the study of athletes for cardiac disease, with most of the data derived from the CRY screening programme. His team has published >230 articles, which have characterised the adolescent athlete’s heart and described the spectrum of electrical and structural modifications resulting from athletic training in black athletes (ie, athletes of African/Afro-Caribbean origin), the prevalence of hypertrophic cardiomyopathy (HCM), the upper limits for the QT interval, right ventricular adaptation, the prevalence and significance of increased left ventricular trabeculations in young athletes, and the role of cardiopulmonary exercise testing in differentiating between athlete’s heart and HCM.

Over the past 3 years, much of Professor Sharma’s research has focused on black athletes. This work led to a recent article in Circulation in which 300 black athletes from 25 sporting disciplines were evaluated between 2006 and 2012 using electrocardiography (ECG) and echocardiography. The article concluded that physiological right ventricular enlargement is common in both black and white athletes,

Professor Sharma screening British Olympic rower Matt Wells.

Professor Sharma’s research has taken him from the hospital and the research bench into the world of international competitive sport at the highest levels. He says, “Ultimately, my dream is to build a state-of-the-art exercise medicine centre to cater for athletes and patients with cardiac disease. I hope to provide exercise prescriptions and classes for patients with obesity, coronary artery disease, and heart failure to help improve their quality of life and prognosis.” Photograph courtesy of Professor Sharma.
and the impact of ethnicity is minimal, obviating the need for race-specific right ventricular reference values. However, the potential for erroneous diagnosis of arrhythmogenic right ventricular cardiomyopathy is considerably greater for black athletes who demonstrate frequent ECG repolarisation anomalies. It is hoped that data from this study decreases the burden of investigations performed in black athletes after ECG screening and minimises the risk of erroneous exclusion from sports participation.

Professor Sharma explains, “I had noticed during my studies on athletes that black athletes exhibited a much higher prevalence of repolarisation changes on the 12-lead ECG that often resembled those in individuals having a heart attack or affected by a cardiomyopathy. I also noted that the males had a greater magnitude of left ventricular hypertrophy compared with their white counterparts in identical sporting disciplines.”

Realising that only a handful of articles involving relatively small numbers existed on black athletes, Professor Sharma appointed research fellow Sandeep Basavarajaiah, MD, to pursue a study on a large cohort of highly trained black athletes. At that stage the black population comprised only 2% of the UK nation, but almost 20% of elite athletes in the United Kingdom were black.

Professor Sharma says, “We compared left ventricular wall thickness measurements in 300 black male athletes and 300 white male athletes of similar ages from the same sporting disciplines. We reported that 13% of black athletes showed a left ventricular wall thickness >12 mm (the usual upper limits in white athletes), and 3% had a wall thickness ≥15 mm, which would be consistent with a diagnosis of HCM.”

“Our findings raised issues about the difficulties in differentiating between black athletes’ hearts and HCM. The issue is relevant because data from the United States show that black athletes are more prone to death from HCM than white athletes. We demonstrated that unlike individuals with HCM, our black athletes had large left ventricular cavities and normal indices of diastolic dysfunction.”

Within Professor Sharma’s group, research fellow John Rawlins, MRCP, demonstrated that black female athletes have more left ventricular hypertrophy than white female athletes. Meanwhile, Michael Papadakis, MRCP, studied repolarisation changes in 904 black athletes compared with 1819 white British and French athletes in collaboration with Francois Carre, MD, PhD, and his group at INSERM in Rennes, France. This study showed that ≥25% of black athletes had T wave inversions compared to just 3% of white athletes and that such changes often signify an underlying cardiac disorder. This finding led to a change in the recommendations for the interpretation of the athlete’s ECG.

Also in Professor Sharma’s group, Abbas Zaidi, MRCP, compared right ventricular dimensions between black athletes and European athletes because the T wave inversion in leads V1 to V4 commonly seen in black athletes is also seen in arrhythmogenic right ventricular cardiomyopathy; Nabeel Sheikh, MRCP, reported on the black adolescent athlete; and Sabiha Gati, MRCP, revealed that black athletes exhibit a high prevalence of increased trabeculations that simulate left ventricular noncompaction.

Professor Sharma comments, “I was concerned that extrapolation of data derived from white athletes would result in unnecessary investigations and potential disqualification in black athletes.”

“Our studies have comprehensively characterised the spectrum of electrical and structural changes in black athletes and will reduce the number of false-positive results in this group. The data are beginning to be translated into clinical practice and inform recommendations in major guidelines in sports cardiology.”

“Through CRY and Greg Whyte, I Assimilated Data That Enabled Me to Devise an Algorithm to Help Differentiate Between Physiological Left Ventricular Hypertrophy and Hypertrophic Cardiomyopathy in Adult and Adolescent Athletes”

Hypertrophic cardiomyopathy was an early interest for Professor Sharma. He says, “I was keen to find out how a condition characterised by a thickened and noncompliant left ventricle (impaired myocardial relaxation) as well as dynamic mechanical obstruction to cardiac output was conducive to intensive exercise.”

“I was also interested in how to differentiate between physiological left ventricular hypertrophy secondary to...
intensive exercise (athlete’s heart) from that observed in HCM.”

“The issue was a delicate one because an erroneous call could have grave consequences. A false diagnosis of athlete’s heart in an athlete with HCM could jeopardise a young life, whereas a false diagnosis of HCM in an athlete with physiological left ventricular hypertrophy would warrant abstinence from intensive exercise and would cost the individual physically and psychologically.”

From 1997 to 2000, Professor Sharma investigated the differentiation between physiological left ventricular hypertrophy from HCM as a cardiac research fellow with Professor William McKenna, BA, MD, DSc, FRCP, FMedSci (see http://circ.ahajournals.org/content/116/12/F67 and http://circ.ahajournals.org/content/120/19/f109) at St. George’s Hospital. He says, “Working in a tertiary cardiomyopathy centre, I had access to numerous patients with HCM. My issue was to make contact with large sporting organisations to identify athletes with left ventricular hypertrophy. Historically such individuals are large males engaged in endurance sports.” He adds, “Professor McKenna assisted me in developing skills in critical thinking and scientific writing. He provided numerous opportunities for me to achieve visibility at major scientific meetings, and he put me forward for several large lectures, including a plenary session on the athlete’s ECG at the European Society of Cardiology Congress in 1999.”

Around this time, Professor McKenna was approached by 2 individuals who have since played significant roles in shaping Professor Sharma’s career: Alison Cox, MBE, chief executive of CRY, who set up the charity after her son was diagnosed with arrhythmogenic right ventricular cardiomyopathy after collapsing during an intensive tennis game; and Greg Whyte, PhD, an Olympic pentathlete who was embarking on a PhD on athlete’s heart and is now professor of applied sport and exercise science, Liverpool John Moores University, Liverpool, England.

Professor Sharma recalls, “Alison was baffled that young athletes did not have their hearts tested before embarking on intensive training regimens, particularly after she realised that most exercise-related sudden cardiac deaths in young athletes were not associated with prodromal warning symptoms. She set up CRY to identify young exercising individuals with potentially sinister cardiac conditions through pre-participation screening, and she asked me whether I would like to become involved as the charity’s cardiologist on a voluntary basis.” Through Alison Cox, the Lawn Tennis Association became the first organisation in the United Kingdom to recommend cardiac screening for all recruits, although screening was a controversial issue at the time, with critics arguing that the diseases were relatively rare and false-positive tests would prove misleading.

Professors Sharma and Whyte tested rowers, cyclists, and endurance runners, and collected athletes with left ventricular hypertrophy. “Through CRY and Greg Whyte, I assimilated data that enabled me to devise an algorithm to help differentiate between physiological left ventricular hypertrophy and HCM in adult and adolescent athletes (white and black athletes),” says Professor Sharma, whose first ever and 1 of his most cited articles was an observational report of the spectrum of ECG changes in 1000 adolescent athletes.7
research fellows in cardiology.” The Sports Cardiology Unit is the first of its kind in the United Kingdom; it screens and advises numerous elite and recreational athletes with potential cardiac disease. Dr Steve Cox (deputy chief executive of CRY) has taken over some of the CRY responsibilities from his mother and is now the screening manager; he coordinates screening for elite athletes, recreational athletes, and numerous schools. He has also supported Professor Sharma’s work and career. “He is very forward thinking and has a superb vision for CRY, which includes the expansion of research and the Sports Cardiology Unit,” says Professor Sharma.

“The Proudest Moment of My Career Because I Was Only 44, Which Is Young for a Professor of Cardiology in the United Kingdom, and I Was Returning to an Institute Where I Had Trained ~10 Years Previously”

Professor Sharma was born in London in 1964, and between 1966 and 1972, his family lived in Africa to be with their extended family. He trained at the University of Leeds Medical School, Leeds, England, between 1983 and 1989, where he was awarded a Medical Research Council scholarship to spend 1 year studying for an additional BSc in Biochemistry in Relation to Medicine. “It began to dawn on me that cardiovascular disease truly was a major problem in the Western world because ~50% of all admissions were related to cardiovascular diseases,” says Professor Sharma. “In the late 1980s, I watched cardiologists with great admiration as they performed echocardiograms and inserted central venous lines and temporary pacing wires. I wanted to be involved in such a medical discipline that combined clinical acumen, diligent emergency care, and practical skill to save lives on a daily basis.”

Professor Sharma embarked on the cardiology rotation at St. Mary’s Hospital in Paddington, London, where he was trained in echocardiography, coronary angiography, and cardiac pacing from 1994 to 1997. Consultant cardiologist David Hackett, MD, was his boss in the mid-1990s and introduced him to Professor McKenna, who would become his educational supervisor and mentor for his doctoral thesis titled “Athlete’s Heart.”

In 2001, Professor Sharma completed his training in cardiology at St. George’s Hospital and was appointed as a consultant cardiologist at University Hospital, Lewisham, London. Over the next 6 years, he established a transoesophageal echocardiography, stress echocardiography, and cardiac pacing service in Lewisham before moving to King’s College Hospital as director of heart muscle diseases.
In 2010, Professor McKenna left St. George’s Hospital for a position at the Heart Hospital, London, “leaving a huge void in the cardiomyopathy service.” Professor John Camm, QHP, MD, BSc, FRCP, CSTJ (see http://circ.ahajournals.org/content/117/11/f61), who had been a mentor to Professor Sharma since he started his research in 1997, encouraged Professor Sharma to apply for the resulting vacant position of professor of inherited cardiac diseases and sports cardiology at St. George’s Hospital. Professor Sharma says, “Professor Camm is an excellent sounding board for various research and career ideas. He strongly encouraged me to return to St. George’s Hospital to establish a cardiomyopathy and sports cardiology service in 2010. This led to the proudest moment of my career because I was only 44, which is young for a professor of cardiology in the United Kingdom, and I was returning to an institute where I had trained ≈10 years previously.” St. George’s Hospital is now 1 of the leading tertiary centres for inherited cardiac diseases in the United Kingdom.

Professor Sharma’s workload is split 50-50 between clinical cardiology and research. He says, “The clinical commitment comprises 4 busy clinics involving assessment, diagnosis, risk stratification, and treatment of patients with inherited cardiac diseases. The clinics are also used to assess young individuals or athletes thought to show cardiovascular abnormalities at the CRY pre-participation screening programme.”

The research aspect involves facilitating, managing, and directing 5 research fellows (separate from his medical team) to obtain an MD or a PhD thesis. Professor Sharma says, “Each fellow is attached to the unit for between 2 and 3 years. Inevitably most of the research is in inherited cardiac diseases and sports cardiology.” The fellows also participate in the CRY screening programme for young athletes and high school children and screened 8000 young individuals in 2012.

Professor Sharma particularly enjoys his teaching commitments, and he has set up a number of courses. He teaches national and international courses for the Royal College of Physicians and regularly lectures at major scientific meetings worldwide. Professor Sharma has been an author of national guidelines on inherited cardiac diseases and sudden cardiac death in young individuals. He is also a consensus panel member on the European Society of Cardiology recommendations for interpreting the athlete’s ECG, the North American Report on Interpretation of the Electrocardiogram of Young Athletes, and the Seattle criteria for the interpretation of the athlete’s ECG.

Over the years, Professor Sharma has won various awards, including a National Bronze award in 2010 for achievements beyond his job specification, and his team received First Prize in the British Cardiac Nursing National Awards for “Innovations in Arrhythmia Care” in 2008.

Professor Sharma also has a recent project grant of £125 000 from the British Heart Foundation to study the mechanisms for repolarisation changes in black athletes and a grant of £700 000 from Aspetar in Qatar to study the genetic basis for the differences in cardiac adaptation between black and white athletes.

In the future, Professor Sharma plans to investigate the veteran athlete’s heart and identify why some black athletes exhibit marked repolarisation changes and/or substantial left ventricular hypertrophy; he has a genetic study in progress to help provide some answers. As the next chair of the European Society of Cardiology Sports Cardiology Nucleus, he also aims to update the current guidelines based on the new developments in sports cardiology, many of which have been provided mainly by his group.

“Casualties Were Being Brought in at an Alarming Rate”

Professor Sharma’s role as lead cardiologist for the London Olympics 2012 was to ensure the medical welfare of the endurance athletes. Although screening athletes for cardiac disease is controversial, it is endorsed by the International Olympic Committee, and screening (funded through CRY and a sponsor) was conducted at the athletes’ bases.

Professor Sharma’s team of cardiac fellows were well prepared to screen the Great Britain Olympic team and had been trained in athlete’s heart for several months. Professor Sharma says, “Based on our research articles, they were familiar with normal variants depending on age, sex, and ethnicity and knew the physiological upper limits to decide whether an athlete had an abnormal ECG or echocardiogram. Our knowledge of black athletes was particularly relevant because they made up 20% of the whole squad, and...”

Professor Sharma with fellow medics at the London 2012 Olympics. Professor Sharma was an Olympic games maker, 1 of 70 000 volunteers who gave up their time to ensure that the London 2012 Olympics ran smoothly. He says, “I was keen to help at the Olympics and was required to apply like everyone else. I had a great deal of experience with the marathon and thought I may be useful for the endurance events. I was 1 of 5000 doctors selected, and I understood that the duties were unpaid and would be performed while I was on holiday. I was also warned that some shifts might last 14 hours. Much to my excitement, I had the role of leading the medical team for endurance events, which included the marathon, triathlon, Olympic swim, endurance cycling including time trials, the 20-km walk, and the 50-km walk. I was measured up and provided with a uniform, swatch watch, drinking bottle, and a small bag.” Photo courtesy of Professor Sharma.
some exhibited marked repolarisation changes that would have been deemed abnormal in inexperienced hands.”

The screening team used the Italian model of a health questionnaire, physical examination, and 12-lead ECG. Those with abnormalities in the preliminary investigations were investigated further. The team identified 2 athletes with Wolff-Parkinson-White syndrome, who were treated with ablation; another with a QT interval of 480 ms but no other evidence of long QT syndrome, so she was allowed to compete; and a rower who developed atrial fibrillation after altitude training that required treatment with flecainide.

Another role for Professor Sharma at the Olympics was as lead cardiologist for the polyclinic, a state-of-the-art medical venue for 16000 Olympic and Paralympic athletes, manned by 500 games makers, including 46 sports physicians and 80 specialists. Services provided included emergency medicine, sports medicine, ophthalmology, dentistry, podiatry, and physiotherapy, with ≈500 people attending each day. Professor Sharma says, “I only saw 2 athletes with cardiac problems but assessed several officials with new-onset angina, 1 with atrial fibrillation, and 1 who developed progressive heart failure.”

Professor Sharma had expected the role of leading the medical team for endurance events to be relatively straightforward. “At the London Marathon, we have between 5000 and 6000 medical contacts and up to 80 admissions to hospital with major collapse, but it is most unusual to see problems in elite runners,” he says. His highest marathon temperature had been 21°C; however, some of the Olympic officials with new-onset angina, 1 with atrial fibrillation, and 1 who developed progressive heart failure.”

Professor Sharma has since received letters from Prime Minister David Cameron and chair of the British Olympic Association, Lord Sebastian Coe, which have been put away along with his uniform and small badge tokens from so many countries. He says, “I look forward to showing them to my grandchildren one day.”

References

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