Spotlight: Michael O'Sullivan, PhD, FRCP

"We Have Been Able to Undertake Some Interesting Research Into Coronary Physiology, Remote Ischaemic Preconditioning, and Coronary Virtual Histology"

Michael O'Sullivan, consultant cardiologist at Papworth Hospital, Papworth Everard, Cambridgeshire, England, and clinical director of the Cardiology Department, Addenbrooke's Hospital, Cambridge, England, talks to Mark Nicholls.

Michael O'Sullivan, PhD, FRCP, consultant cardiologist at Papworth Hospital, Papworth Everard, Cambridgeshire, England, and clinical director of the Cardiology Department, Addenbrooke's Hospital, Cambridge, England, was awarded the British Cardiac Society Young Research Worker's Prize in 2002. However, because he is an interventional cardiologist at heart, he decided against a career in basic scientific research, but the experience provided him with the opportunity to learn a lot about research methodology and to recognise the importance of collaboration to achieve output within the area of translational research.

Born in Belfast, Northern Ireland, in 1968, Dr O'Sullivan moved to England to study medicine at Cambridge University and graduated with distinctions in 1992. After house officer jobs, including 1 in cardiology at Addenbrooke's Hospital (Cambridge University Hospitals NHS Foundation Trust), he took up a senior house officer position at Royal Brompton National Heart and Lung Hospital, London, England, before moving to Oxford, England, to complete senior house officer training at the John Radcliffe Hospital. In 1996 he took up a position on the Cambridge registrar training scheme, rotating between Addenbrooke's and Papworth Hospitals.

Dr O'Sullivan says, "I have always enjoyed working with my hands and witnessing the immediate benefits of procedural work. Like all interventional cardiologists, I enjoy the technological side of things and being part of a rapidly evolving field that is ripe with research opportunity." Photograph courtesy of Cambridge Heart Clinic.

"I Gain Particular Satisfaction From Managing Cardiac Problems in Those With Complex Noncardiac Disease"

Like many interventional cardiologists Dr O'Sullivan, enjoys the technological advances the field offers. Indeed, as a medical student this prospect was a factor that first attracted him to cardiology. He says, "I found that the diversity of cardiac disease, the interplay between heart disease and other organ systems, and the variety of modalities for investigation and treatment fuelled my enthusiasm. I knew that the rate of technological progress within cardiology would mean that working within this specialty would keep me interested throughout my career." More recently, he has helped drive these advances forward by trialling techniques for percutaneous valvular intervention.

Dr O'Sullivan's main mentor has been Professor Peter Weissberg, MD, FRCP, who is now medical director of the British Heart Foundation. He says, "Peter has a wonderful ability to break a complex and daunting problem, be that clinical, research, or managerial, into simple steps, each of which can be addressed. He has been highly successful in his career but remains humble and approachable."

After completing his PhD and further training in interventional cardiology at Papworth Hospital, Dr O'Sullivan completed an enjoyable and rewarding 1-year fellowship in interventional cardiology at the University of British Columbia between 2003 and 2004 in Vancouver, Canada, fine-tuning his skills, gaining exposure to the array of interventional techniques, and being involved on a day-to-day basis in interventional research, as well as developing a passion for skiing.

On his return to Cambridge in 2005, Dr O'Sullivan was appointed to a consultant post that divides his time between Addenbrooke's Hospital (Cambridge University Hospitals NHS Foundation Trust) and Papworth Hospital. In this role he contributes to the general cardiology service at Addenbrooke's Hospital and is involved with the busy interventional service at Papworth Hospital, which is the United Kingdom's largest specialist cardiothoracic hospital. He became clinical director of the Cardiology Department of Addenbrooke's Hospital in 2006. He says, "This position allows me to indulge my interests in both interventional cardiology and cardiac disease as encountered in noncardiac conditions. Working across 2 clinical services presents challenges, and I am drawn in opposite directions at times. I find it essential to clearly delineate my duties on both sites."

Dr O'Sullivan believes it is important to continue to partake in the general cardiology rota, rather than focusing all his energy on interventional cardiology. He explains, "I think it is essential that we treat the patient as a whole, not

Addenbrooke's Hospital (Cambridge University Hospitals NHS Foundation Trust). Dr O'Sullivan's managerial responsibilities involve directing the day-to-day function of Addenbrooke's Hospital cardiology service. In addition he is involved in the strategic planning of future cardiac developments within the region as part of the major project to relocate Papworth Hospital to the Cambridge Biomedical Campus where it will sit next to Addenbrooke's Hospital. He explains, "This move will carry major benefits for patients who will have easier access to noncardiac services. As a result of our increasingly elderly population with consequent comorbidities, ease of access to other specialties is becoming even more important." Photograph courtesy of Cambridge University Hospitals NHS Foundation Trust.

solely as a diseased artery. I gain particular satisfaction from managing cardiac problems in individuals with complex noncardiac disease, and my work at Addenbrooke's gives me the opportunity to become involved in these challenging cases. Increasingly, I find myself involved with the cardiac management of patients requiring noncardiac transplantation, which is a challenging area requiring extensive multidisciplinary work." There is an active and renowned kidney, liver, and pancreas transplantation programme at Cambridge University Hospitals NHS Foundation Trust, and Papworth Hospital has a reputation for innovation in transplantation. It carried out the first successful heart transplantation in the United Kingdom in 1979, followed by Europe's first successful heart and lung transplantations in 1984, and the world's first heart, lung, and liver transplantations in 1986.

"A Great Opportunity to Blur the Distinction Between Academic Physicians and 'Jobbing' National Health Service Consultants Such as Myself"

Cambridge has been chosen as 1 of 5 Academic Health Science Partnerships in the United Kingdom. The partnerships have been selected based on their ability to demonstrate excellence in clinical care, research, and clinical teaching. Dr O'Sullivan has a core role in shaping cardiac services within this partnership, which includes Cambridge University, Cambridge University Hospitals NHS Foundation Trust, and Papworth Hospital NHS Foundation Trust.

Dr O'Sullivan explains, "It is hoped that such centres will work at the forefront of biomedical research, greatly improving translational research and speeding the transition from basic research output to changes in clinical practice. I see this as a great opportunity to blur the distinction between academic physicians and 'jobbing' National Health Service consultants such as myself. I strongly feel that collaboration between scientists and clinicians with training in research is the key to progress in medical research. Scientists often generate clinical hypotheses but may have difficulty testing them, while clinicians may not be strong at generating the hypotheses or writing successful grant applications but are in a position to test hypotheses in the clinical setting."

In research terms, Dr O'Sullivan believes that his best contribution is made as a clinician working alongside academic cardiologists. He maintains an active interest in clinical and translational research, and he finds that the best way to achieve this goal is through collaboration with the academic cardiology unit. Over the past 3 years, his main research efforts have been through collaboration with Martin Bennett, PhD, FRCP, FMedSci, British Heart Foundation professor of cardiovascular sciences, and David Dutka, MD, FRCP, of the Division of Cardiovascular Medicine, University of Cambridge. Professor Bennett and Dr Dutka have research backgrounds in vascular biology, coronary physiology, and cardiac imaging, and have active and successful research programmes, while Dr O'Sullivan facilitates the catheterisation laboratory-based side of their research.

Dr O'Sullivan says, "With the support of other interventional colleagues at Papworth, we have been able to undertake some interesting research into coronary physiology, remote ischaemic preconditioning, and coronary virtual histology.[1,2] I feel that contributing to such collaborations that span from bench-based basic science to in-human studies is where busy National Health Service clinicians have most to offer. Few National Health Service clinicians are able to establish, obtain funding for, and run such programmes alone given their other duties."

Another area of interest for Dr O'Sullivan is in trials of new interventional devices, particularly in the emerging field of percutaneous mitral valve repair. He explains, "This technology has lagged behind percutaneous therapies for aortic valve disease, but there are some promising technologies coming through. It is interesting to be involved at this early stage but I think we have several years to go before such therapies become commonplace." Dr O'Sullivan is

In the future, Dr O'Sullivan plans to continue to develop collaborative research programmes looking at plaque biology and coronary physiology. He explains, "I also find the whole area of percutaneous valve therapy very exciting and plan to develop a subspecialty interest in the area of percutaneous mitral valve therapy. Much time will undoubtedly also be spent shaping cardiac services within the new Cambridge Academic Health Sciences Centre." Dr O'Sullivan lives in Cambridge and is married with 2 sons aged 4 and 6. He says, "My 4-year old son is certain that he wishes to 'fix hearts' alongside me, while my 6-year favours a 'short hours job' that would give him more time for sport." Away from medicine Dr O'Sullivan's interests include tennis, running, modern literature, and skiing. Photograph courtesy of Papworth Hospital NHS Foundation Trust.

the UK Chief Investigator for the EVOLUTION II trial, with Papworth Hospital as the lead UK centre, looking at a new minimally invasive procedure for the treatment of mitral regurgitation. On June 25, 2009, he and his colleague, Peter Schofield, MD, FRCP, performed the first such procedure at Papworth Hospital. The patient responded well and was able to return home the next day. Although he acknowledges that it could be several years before such procedures are in widespread use, Dr O'Sullivan is enjoying the opportunity to develop the technique.

An Opportunity to Learn About Research Methodology and to Recognise the Importance of Collaboration

Early in his career, Dr O'Sullivan carried out award-winning research. During his registrar training between 1999 and 2002, a Wellcome Trust research fellowship allowed him to complete a PhD in vascular biology looking at mechanisms underlying in-stent restenosis at the Cambridge University Department of Cardiovascular Medicine under the supervision of Professor Bennett.[3,4] He says, "I studied cell-cycle regulation in coronary in-stent stenosis—a very topical subject at that time, when multiple potential therapies for this condition were being tested but our understanding of the basic mechanisms of restenosis was limited." The research involved obtaining human tissue by coronary atherectomy and study of cell-cycle regulation in cells cultured from this tissue, and through this it was possible to demonstrate differences in cell-cycle control among restenotic, atherosclerotic, and normal vascular smooth muscle cells. In 2002, Dr O'Sullivan was awarded the British Cardiac Society Young Research Worker's Prize for this work.

"Treat the Patient as a Whole, Not Merely as an Artery or Accessory Pathway"

Dr O'Sullivan advises individuals planning a career in cardiology to identify a field that inspires their interest early in their career, and then make sure that every career decision points them in that direction. "At the same time," he adds, "you shouldn't be too rigid in your thinking. It may be that you are diverted off that pathway into something more suitable, interesting, or fulfilling. At all times remember that cardiology is about treating patients. Treat the patient as a whole, not merely as an artery or accessory pathway. It may be old fashioned, but you can often learn more about how to deal with a patient by listening to him or her than by ordering a multitude of complex tests."

Dr O'Sullivan believes that the main developments in the treatment of coronary artery disease will be in the area of identifying vulnerable plaques. He says, "We still do not have a reliable noninvasive means of identifying plaques that are likely to rupture. Virtual histology and coronary optical coherence tomography provide potential invasive means of identifying vulnerable plaques, but much exciting work is yet to be done. When we can reliably identify such plaques, the next big question is how best to stabilise them. In particular, will a targeted invasive approach add anything over systemically administered drug therapy?"

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