Successful Scholar

The Trainee has found that exercise is not for everyone

A 2012 recipient of a Foundation for Surgery Scholarship, Dr Chris Delaney, used the attached funding to expand his research investigating the effects of exercise on the clinical, systemic and local biological responses in patients with intermittent claudication.

From the Latin word “claudicare”, which means to limp, claudication refers to pain or cramping in the lower leg due to inadequate blood flow to the muscle, the most common cause of which is peripheral artery disease brought on by atherosclerosis.

A SET2 Vascular Trainee, Dr Delaney undertook his PhD research to determine the most effective exercise regimen for patients with intermittent claudication, as measured by improvement in pain-free walking performance.

The research also assessed the impact of different exercise modalities on endothelial function, body composition and skeletal muscle protein expression as well as inflammatory cytokines.

He said that low-intensity exercise was now the recommended first line treatment for intermittent claudication, largely because of the risks posed to such patients by surgery given that most have compromised immune systems caused by diabetes, long term smoking, high blood pressure and high cholesterol.

Surprisingly, he said that his findings suggested that, contrary to current thinking, such exercise could also lead to long term damage to the heart, musculo-skeletal system and major organs.

Working through the Flinders Medical Centre in South Australia and conducting his research through Flinders University, Dr Delaney examined 111 patients with intermittent claudication to assess the impact of treadmill-based exercise or in combination with resistance training, stimulation of a pro-angiogenic response, skeletal muscle metabolic adaptation to ischaemic conditions and psychological improvements in pain perception.

“We found that while such low-intensity exercise could offer patients short-term pain relief, there are suggestions it could also lead to long-term adverse effects,” Dr Delaney said.

“This potential long term harm could arise from a reduction in the bio-availability of nitric oxide and also the presence of calcified plaques which have been linked with tissue atrophy following ischaemia-reperfusion injury. “Claudication is essentially repeated low-grade exposure to ischaemia-reperfusion injury. Supervised exercise training, in particular treadmill-based training, may increase the frequency of exposure to ischaemia-reperfusion injury, leading to an increase in calcified proteolytic activity and muscle wasting. This is significant given that preservation of skeletal muscle is integral to healthy ageing.”

Dr Delaney is conducting his PhD research under the supervision of Professor Ian Spark, Head of Vascular Surgery at Flinders Medical Centre.

He has written three papers describing his findings which are in various stages of the review process and is now in the process of writing a fourth paper on the inflammatory response of claudicants following treadmill exercise and the increased presence of inflammatory cytokines.

He said his findings of possible long-term detrimental impacts came as a surprise and could lead to changes in the treatment of intermittent claudication if larger studies were conducted that supported his findings.

“We were very surprised to find that exercise might be harmful given that I set out to try and find the optimal exercise regime,” Dr Delaney said.

“We certainly didn’t expect to find that patients were losing muscle mass because of the reperfusion injury which is of considerable concern given that muscle mass is important to regulating the basal metabolic rate.”

“Our results mean that we can say that while such treadmill walking can ease pain, that pain relief may come at the cost of long term health indices.”

Dr Delaney said that if further studies supported his findings, vascular surgeons may begin to offer surgical intervention sooner than is now usually offered.

“Our findings do mean that we should offer open or endovascular intervention to patients with intermittent claudication earlier,” he said.

“We could go into the leg and use stents and balloons to improve blood flow, but we need much bigger numbers before we consider changing current treatment protocols.”

“There would also have to be long-term follow-up studies conducted on such patients to track any adverse impacts over time in terms of disease progression and cardio vascular events. “This is just a small trial; however, most other research in this field has concentrated only on walking performance so our work is unique in that we took a broader view and as such found processes at work that we were not expecting.”

Dr Delaney said he hoped to have his PhD thesis completed by early next year after which he would be taking up a position at the Royal Adelaide Hospital as a SET2 Vascular Trainee.

Employed for the past two years as a Vascular Surgery Research Fellow at the Department of Vascular and Endovascular Surgery at the Flinders Medical Centre, Dr Delaney said the funding support of the College allowed him to expand the tests he could conduct and design or buy the equipment he needed.

He has also received funding support from Flinders University and two grants from the Foundation Daw Park Project.

Most recently, Dr Delaney presented the findings of his research at the Annual Scientific Meeting of the Australian and New Zealand Society of Vascular Surgery, where he was awarded the prestigious Atrium Prize for best presentation by a Trainee.

With Karen Murphy

Successful Scholar

Surprising Research

Dr Delaney at work

As part of the research he assessed not just pain-free walking distance, but also assessed endothelial function by brachial artery flow mediated dilation, reactive hyperaemia index and by conducting muscle biopsies and serum analysis of nitric oxide levels and asymmetric dimethyl arginine.

He found that improvement in walking performance was not associated with an improvement in endothelial function and that a reduced bio-availability of nitric oxide associated with such exercise may have a detrimental impact on endothelial function and long-term health outcomes.

“Supervised exercise training is currently recommended as the first line of treatment for patients with intermittent claudication with meta-analyses demonstrating a significant improvement in walking performance,” Dr Delaney said.

“Several mechanisms have been proposed to explain this, including the most effective exercise regimen for intermittent claudication, was now the recommended first line treatment for intermittent claudication, largely because of the risks posed to such patients by surgery given that most have compromised immune systems caused by diabetes, long term smoking, high blood pressure and high cholesterol.

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