As a world-leading expert, Dr Andrei Krassioukov gives an insight into his groundbreaking work towards improving the cardiovascular health of individuals with spinal cord injury

What originally drew you to the study of spinal cord injury (SCI)?

My PhD work was a combination of studies on autonomic dysfunctions, cardiovascular control and SCI. SCI was one of the tools we used to model, in animals, the most devastating clinical scenarios associated with the significant blood pressure abnormalities we know about. However, only after the successful completion of my training – and having started my clinical practice in Estonia in 1984 as a young neurologist for the first time – was I faced with the devastating reality of SCI.

During this time, the majority of individuals with SCI in the former Soviet Union were young soldiers injured in the War in Afghanistan, which began in 1979. They were either sent to their homes with no support, or left at the military hospitals, as their families were not able to take care of them. The situation was a shocking reality for me to face. I then made it my goal to find a way to help these people in my clinical work, and to find solutions for them in my basic research. In 1991, through the research exchange between Canada and the Former Soviet Union, I was invited to Canada where I continued this work.

As the main cause of death in people with SCI, is enough research conducted into cardiovascular disease, and in particular, its connection to SCI?

No, not at all. For many years, the research community focused predominantly on motor recovery, and in everybody’s mind curing paralysis was the priority. However, when researchers finally started to focus on the needs and goals of individuals with SCI such as to continue to be equal members of their communities, another picture emerged – issues related to the autonomic nervous system are the priority. These were the findings of an important study published by one of my colleagues, Dr Kim Anderson, who is presently working at the Miami Project to Cure Paralysis.

Have you encountered any difficulties with securing financial support for your research?

It is well known that research is currently an extremely competitive business! Scientists and clinicians have to work incredibly hard in order to be competitive and stay in the game. My lab has done well during the last few years, but there is extremely tough competition. I spend about 30 per cent of my time writing grant proposals and applications for various programmes. In addition, I have to run my clinical practice, manage my clinical and basic science laboratory and find time for teaching at the university. However, this scenario will be familiar to any clinician-scientist in Canada.

I truly believe it is of crucial importance that government and society have a strong commitment to support research as this is an investment into the future economy, health, wellbeing and, equally important, nurturing our young generation of scientists. Without research funding I cannot vision success for the future.

What role do you play in educating healthcare providers on the management of cardiovascular emergencies in people with SCI?

As a researcher, a clinician working in a hospital and a member of numerous international associations with a focus on SCI, I am extremely committed to the education of the new generation of scientists and medical professionals, as well as consumers. I am an Educational Committee member of the International Spinal Cord Society (ISCoS) – the largest world organisation of doctors, nurses, and other medical professionals. For the past six years I have also been Chair of the International Autonomic Committee of ISCoS and the American Spinal Injury Association, and under my guidelines, the new international standards for the assessment of autonomic functions following spinal cord injury were developed. They have now been translated into numerous languages, and are recognised around the world. Furthermore, I dedicate part of my research to examining how different modes of education could affect clinical practice and improve medical care for individuals with SCI.

Would you like to highlight any upcoming events or conferences related to this work?

In April 2014 I will represent ISCoS as a guest speaker at the Uruguayan Congress of Physical Medicine and Rehabilitation where I will present the latest advances in autonomic assessment of individuals with SCI to colleagues from South America. In May 2014, in San Antonio, Texas, six of my graduate students and postdoctoral fellows will have podium presentations at the annual American Spinal Injury Association (ASIA) meeting – the largest North America meeting of SCI experts. All of these presentations were selected by the programme committee as the best submitted projects. I am extremely glad that there is more and more interest in autonomic dysfunctions after SCI as this directly connects to quality of life. Above all, I am proud of the achievements of my students and postdoctoral fellows.
MOST ABLE-BODIED PEOPLE look upon spinal cord injury (SCI) as a life-changing event resulting in permanent debilitation, and research towards improving the lives of those with SCI conducted by able-bodied researchers has often focused on curing paralysis itself. However, studies have shown that the perception among individuals with SCI is slightly different. For them, SCI and paralysis are not the end result of trauma, but the beginning of other health problems: loss of bladder and bowel control; loss of sexual function; and cardiovascular disease. In addition to finding cures for paralysis, individuals with SCI are interested in health solutions for their ongoing lives as paralysed people.

Cardiovascular disease is the most common cause of illness and death among people with SCI, who exhibit cardiovascular risks from a younger age and more frequently than the general population. Furthermore, individuals with SCI are also at risk from other cardiovascular abnormalities, of which autonomic dysreflexia (AD) is one of the most common and life-threatening. AD affects up to 90 per cent of individuals with cervical and high-thoracic level SCI, and is associated with a significant elevation in blood pressure that could precipitate heart attack, cerebral bleeding, and even death.

CARING FOR CANADA

Despite being common, deadly and easily triggered, AD is not a problem with which all people with SCI and caregivers are familiar; management of the condition, whether provided by caregivers or medical professionals, is often suboptimal. Health researchers estimate that the appropriate management of AD could reduce annual healthcare spending in Canada by CAD $70 million. This condition also has a particular impact on wheelchair athletes with SCI who participate in competitive sport. Many athletes with disabilities actually use the condition to gain a competitive advantage, in a practice known as ‘boosting’. Although this is banned by the International Paralympic Committee (IPC) as a dangerous practice, some athletes with SCI are still unaware of the health risks it presents.

A group of researchers at the International Collaboration on Repair Discoveries (ICORD) research centre in Vancouver has devoted a considerable amount of attention to the issues related to cardiovascular disease in people with SCI. Led by Dr Andrei Krassioukov, the laboratory was last year awarded a $1.9 million team grant by the Canadian Institutes of Health Research (CIHR) to pursue work on improving the cardiovascular health of Canadians with SCI and educating medical professionals on how life threatening episodes of AD can be managed. The team’s work also extends to educational efforts for patients and carers in order to better prepare them for living with SCI.

EXERCISE AND AWARENESS

AD usually occurs in individuals with SCI with injuries above the sixth thoracic vertebra, but has been known to strike those with injuries as low as the tenth. Following SCI, the neurons of the spinal cord and brain involved in regulating blood pressure often lose their connections, resulting in disorganised blood pressure control responses. Irritations that would usually be benign in an able-bodied person – eg. sunburn or a full bladder – can then result in unpredictable increases in arterial blood pressure, because the descending inhibitory input from the brain to the spinal cord is unable to control the reaction initiated from an irritated bladder or the skin. Krassioukov’s research programme seeks to pursue two main routes to improved cardiovascular health in those with SCI: firstly, through optimised exercise to reduce the risk of cardiovascular disease, and secondly, through targeted education to improve awareness and management of AD. To this end, Krassioukov’s group has conducted a wide variety of studies into the cardiovascular aspects of SCI, and is responsible for the production of a range of educational documents for healthcare professionals and patients. In reference to his team’s CIHR-supported work, Krassioukov remarks: “This is a pioneering project that explores the mechanisms underlying cardiovascular dysfunctions and the possible effects of exercise in chronic SCI”. The researchers hope the programme will facilitate the development of focused preventative strategies across Canada.

A SPORTING CHANCE

Much of Krassioukov’s work over the last few years has been conducted as part of an ongoing involvement with the Paralympic Games.
Beginning with the 2008 Games in Beijing, his team has been responsible for operating cardiovascular educational health clinics for Paralympians involved in the Olympic and Winter Olympic Games; this year, they will work at the Sochi 2014 Winter Paralympic Games in Russia. The clinics are a good way of disseminating knowledge on AD and cardiovascular disease to Paralympic athletes and their coaches, and provide the ideal setting for the collection of further autonomic and cardiovascular data, including information on AD and its effects on athletes with disabilities, as each clinic sees between 30 and 60 world-class wheelchair athletes.

As part of their studies in cooperation with the International Wheelchair Rugby Foundation (IWRF), the Canadian researchers found that the degree of autonomic response a wheelchair athlete shows is strongly correspondent with their exercise performance – unlike the IWRF’s own classification system. Based on this, as well as the revelation that AD may be an exclusive hindrance to wheelchair athletes with SCI, Krassioukov has recently begun working with the IPC to develop an autonomic classification for athletes to complement existing IPC classifications, with the aim of making future competitions more equitable.

**TOOLS FOR TREATMENT**

The Canadian researchers recently launched a web-based educational module to help paramedics recognise and manage life-threatening AD episodes. The project was completed in collaboration with a number of Canadian institutions, including the British Columbia Institute of Justice, and funded through the CIHR’s Knowledge Translation grant, a special fund from Medtronic and a grant from Paralyzed Veterans of America. Krassioukov is also responsible for developing PleasuRable, a free guide to the resources available to individuals with SCI wishing to remain sexually active despite the limitations of their condition. This project was undertaken in cooperation with the Disabilities Health Research Network. Collectively, these tools – in conjunction with others produced by Krassioukov’s group – represent practical solutions for improving the health and quality of life experienced by those with SCI.

A number of other SCI lines of investigation are also currently underway in Krassioukov’s lab, including a Craig Neilsen Foundation-funded project that makes simultaneous use of animal and human models to map the cardiac changes that take place following SCI, and to determine whether an exercise regime can have a significant impact on those changes. Another project, supported by the Rick Hansen Institute and Allergan and due to conclude this year, aims to assess the efficacy of botox injections in blocking AD responses to the filling of the bladder. The range of studies already performed by ICORD, as well as those still in progress, reflect the researchers’ commitment to the discovery of novel solutions for individuals with SCI.

**A LONG JOURNEY**

Krassioukov and his team have come a long way in their efforts to make life easier for those suffering with SCI, but it has not been an easy process. Reflecting on the early part of his career, Krassioukov recalls: “I submitted one of my first grant applications on the issue of AD to one of the prestigious Canadian funding agencies in 1994. The reviewers’ response was to tell me that there were no autonomic issues associated with SCI”. Today, despite being recognised as a world-leading expert on AD and having received funding from a range of prestigious organisations, Krassioukov is still working hard to secure a future for his work – and continued hope for people with SCI worldwide.