Medizinische Hochschule Hannover

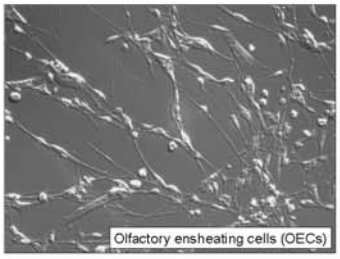
FESSH JUNIOR TRAVEL AWARD 2010

University College in London, Peripheral Nerve Injury Unit, Professor Thomas Carlstedt

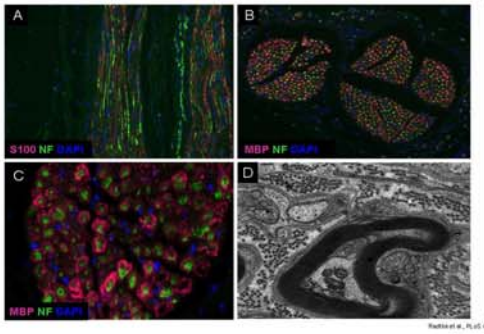
Division of Surgery and Interventional Science and Royal National Orthopaedic Hospital

November 15th to November 30th 2010 **Awardee: Christine Radtke, Hannover, Germany**

The focus on restoration of function and control of pain after nerve injury has led to some fundamental areas of research in relation to nerve regeneration and the critical period between injury and surgery that determines functional outcome. I visited with the FESSH Junior Travel Award Professor Thomas Carlstedt and Professor Geoffrey Raisman at University College in London. Professor Carlstedt is a renowned specialist in Hand and Orthopaedic Surgery where with focus on in surgery for brachial plexus and associated spinal root injuries. Professor Raisman is a renowned neuroscientist at University College working in the area of spinal cord injury and nerve injury using cellular transplantation techniques. Professor Raisman and Carlstedt have an ongoing collaborative effort to study the potential of olfactory ensheathing cells (OECs) to improve nerve regeneration after brachial plexus injuries. Professor Carlstedt has a quite unique combination of basic science and clinical surgical training. The is recognized as a leading centre for the treatment of complex peripheral nerve injuries. Surgeries include highly complex brachial plexus nerve repair and nerve transplantations in both infants and adults. Some patients are seen and treated as emergencies as a result of acute trauma, and others are referred because of chronic problems associated with earlier injury.



Olfactory ensheating cells (OECs) in culture: unique properties after transplantation into spinal cord and peripheral nerve include enhancement of axonal regeneration and remyelination

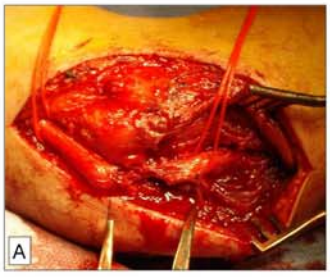


Radtke et al., PLoS One, 2011

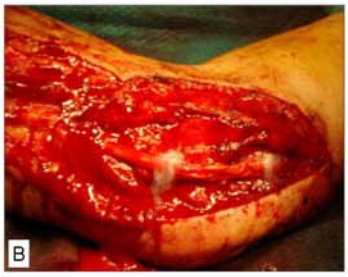
Experimental nerve regeneration by implantation of an innovative nerve conduit:

The constructs survived and integrated into repaired nerves.
Axonal regeneration could be archived in 6.0 cm nerve defect with an artificial construct.

(A) Positive staining for S100 revealed Schwann cell migration. MBP (myelin basic protein) and EM demonstrated remyelination of regenerated nerve fiber in the constructs (B-D)



Example of an an injured ulnar nerve in a 24 year old patient after after blunt injury. The photograph is demonstrating the resulting nerve defect.



Ulnar nerve reconstruction: the photograph shows the intraoperative result after peripheral nerve reconstruction by sural nerve transplantation.

Young surgeons enjoy extremely being part of the team and being trained at the Peripheral Nerve Unit at the Royal National Orthopaedic Hospital in Stanmore, UK.

Traumatic events, such as work place trauma or motor vehicle accident violence, result in a significant number of severe peripheral nerve lesions, including nerve crush and nerve disruption defects. Transplantation of myelin-forming cells, such as Schwann cells (SCs) or olfactory ensheathing cells (OECs), may be beneficial to the regenerative process because the applied cells could mediate neurotrophic and neuroprotective effects by secretion of chemokines. During my residency here at the Hannover Medical School I have in parallel to my clinical work carried out a number of interesting and creative experiments with regard to future clinical transfer related to the cell biology of olfactory ensheathing cells. Major focus has been on characterization and transplantation of OECs after nerve injury into the peripheral and central nervous system for axonal regeneration and remyelination of injured nerve fibers. An important aspect of the work is the phenotypical characterization of olfactory ensheathing cells (OECs) which have been shown to have remyelinating potential and the ability to encourage axonal regeneration in peripheral nerve and moreover even in the spinal cord after transplantation. The ultimate goal is find a phenotypic "signature" on these cells to predict if they will remyelinate *in vivo*. This is important because if the cells are used in clinical studies expansion of the cells will be important as will knowledge of the behavior of the expanded cells. To this end, we have now transplanted cells under various culture conditions and developed a unique nerve conduit for peripheral nerve defects. Our primary goal is the optimize surgical peripheral nerve repair. An important challenge is to translate the recent advances in regeneration biology to novel surgical interventional approaches in the treatment of nerve injury. The FESSH Junior Travel Award made it possible to combine basic scientific knowledge with the clinical work of world famous peripheral nerve surgeons and scientists.

The FESSH Junior Training Award helped certainly to advance my knowledge and clinical work. Moreover, this fabulous experience consolidated and attracted me to continue important work on cell-based therapies for regeneration of nerve injury.

I am very pleased and honored to be a recipient of the FESSH Junior Travel Award and I am very thankful to the FESSH for this experience.