



T. Brinker

**Thomas Brinker**

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- 1984** M.D. The Aachen University of Technology
- 1994** Ph.D. Medical School Hannover
- 1994** Assistant Professor of Neurosurgery, Klinikum Hannover
- 1999** Associate Professor of Neurosurgery, Klinikum Hannover

**Current Research**

Our research is focused on experimental and clinical Neurosurgery:

- Restorative Neurosurgery
- Development of neurosurgical techniques
- New media and internet technology for teaching of students
- Clinical studies

**Restorative Neurosurgery:**

“Restorative Neurosurgery” means treatment procedures which are aimed to improve the conditions of patient with neurodegenerative disorders or of patients with a permanent deficit following brain injury, e.g. after stroke or head injury. For that purpose new biotechnical strategies are of particular interest. The corresponding activities of our group are summarized as follows:

The BMBF research project „Neuronenmikrosonde“ (1999-2003), was aimed to develop a biotechnical microstructure to enable electrical contacting of a peripheral nerve. Stimulation of the nerve as well as the recording of nerve signals should become possible. The concept of a “nerve prosthesis” for functional electrical stimulation of a paralyzed muscle and its clinical application was the goal of the project. The contribution of our group was to develop the concept and to demonstrate the feasibility of such a “nerve prosthesis”. It could be demonstrated that the transplanted motoneurons reinnervated the severed nerve and its target muscle, and that electrical stimulation was possible using the polyimide sieve electrode as a technical interface for improved nerve regeneration.

Another research project of peripheral nerve restoration is aimed to develop a new technique for anastomosis of transected peripheral nerves using a flexible chitosan film instead of the classical microsurgical suture. Research partners: Alvito Biotechnologie GmbH Kleinmanchnow, Central Animal Laboratory of the Medical School Hannover

The ongoing BMBF research project “Tennis” (2002-2005) is aimed to develop a population of cells that start protein synthesis after electrical stimulation. In future, such a cell population (“cell-line”) producing endorphines may serve as a biotechnical implant for the treatment of “intractable pain”, e.g. in cancer patients. Research partnerships: CellMed AG Alzenau, NMI Reutlingen

Our group provides extensive knowledge on animals models of brain injury following head trauma, stroke and hydrocephalus. These models, which were developed over the past 10 years, are now in use for studying both mechanisms of neuronal degeneration and regeneration. Of particular interest are new treatment modalities of brain injuries, e.g. by means of transplantation of genetically modified cells, which may produce biologically active proteins, e.g. neuroprotective agents. Research partnership: CellMed AG Alzenau

## Development of neurosurgical techniques:

"Neuronavigation" describes a technique which enables the neurosurgeon to visualize the spatial position of a surgical instrument within the preoperative imaging (CT or MRT) during surgery. This provides an improved orientation of the neurosurgeon during the surgical procedure. We used the technical equipment of neuronavigation for measuring the 3D coordinates of anatomical structures during surgery and for building 3D CAD models with those data. The future goal is the development of new surgical techniques based on a quantitative spatial analysis of the intraoperative situs. Furthermore, we aim to develop three dimensional polygonal models which may be optically beamed into the microscopic view of the surgeon in order to improve his spatial orientation similar to the navigational help used by jet pilots.

## New media for student's education:

The ongoing project "Teaching and Training Network in Neurosurgery" is aimed to develop an internet-based database, which provides multimedia material from the operation theatre for education and training of students. That BMBF project is headed by the Institute of Medical Informatics of the MHH (Prof. Matthies), additional research partners are the Department of Neuropathology (Prof. Walter) and Neuroradiology (Prof. Becker) of the MHH.

## Clinical studies:

In the clinical field, our group starts with a prospective multicenter clinical study to collect data from patients with normal pressure hydrocephalus. As a special feature, this study is using internet technology to collect and analyze the data from more than 20 european contributing centers.

## Future Project and Goals

Our research will focus on the development of new treatment strategies in neurosurgery. We will take advantages from progresses made in the field of biology and technology in order to develop new clinical applications in "Restorative Neurosurgery".

## Selected Publications

[1] Schuhmann MH, Stiller D, Skardelly M, Bernarding J, Klinge PM, Samii A, Samii M, and Brinker T. Metabolic changes in the vicinity of brain contusions: a proton magnetic resonance spectroscopy and histology study. *J Neurotrauma* 20, 725-743 (2003).

[2] Klinge PM, Samii A, Muhlendyck A, Visnyei K, Meyer GJ, Walter GF, Silverberg GD, and Brinker T. Cerebral hypoperfusion and delayed hippocampal response after induction of adult kaolin hydrocephalus. *Stroke* 34, 193-199 (2003).

[3] Klinge PM, Groos S, Wewetzer K, Haastert K, Rosahl S, Vafa MA, Hosseini H, Samii M, and Brinker T. Regeneration of a transected peripheral nerve by transplantation of spinal cord encapsulated in a vein. *Neuroreport* 12, 1271-1275 (2001).

[4] Samii A, Brinker T, Kaminsky J, Lanksch WR, and Samii M. Navigation-guided opening of the internal auditory canal via the retrosigmoid route for acoustic neuroma surgery: cadaveric, radiological, and preliminary clinical study. *Neurosurgery* 47, 382-387 (2000).

[5] Klinge PM, Berding G, Brinker T, Knapp WH, and Samii M. A positron emission tomography study of cerebrovascular reserve before and after shunt surgery in patients with idiopathic chronic hydrocephalus. *J Neurosurg* 91, 605-609 (1999).

## Group Structure

Group leader:	Thomas Brinker
Senior scientist:	S. Lindemann
Doctoral fellows:	I. Levy
Graduate students:	none at present
Technicians:	Fr. Maniera, Fr. Schöne
Cooperating scientists:	P.M. Klinge, A. Samii, W. Lüdemann

## Contact

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