

**"VICTOR BABEȘ" UNIVERSITY OF
MEDICINE AND PHARMACY TIMIȘOARA
DOCTORAL SCHOOL
MEDICINE**



HABILITATION THESIS

Cranial Nerve Dysfunction Syndromes

Summary

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**Timișoara
2024**

Summary of the Habilitation Thesis

Throughout the 25 years of my medical and scientific career I've had the opportunity to participate in many projects and develop in several directions, all thanks to the many good willing professors that I have encountered.

I started as a medical student at the University of Medicine and Pharmacy “Victor Babes” in Timisoara in 2000 but I was already accustomed to a medical environment many years before thanks to my family and mentors in the field: both my parents. They have been my true mentors in my medical career and my subsequent professors have only brought refinements to the basic ideas and values that I learned early in life and in my medical career.

From the beginning I got involved in scientific research with a particular interest in pain research. The first actual study I ever participated in was with **Dr. Ovidiu COSTE** at the Physiology department of the UMFT. This led to the first study and scientific publication in the form of a poster at the Physiology National Congress in 2001. While not necessarily significant from a scientific point of view this was decisive and had a lasting impression on me. Ever since I continued to endeavor in the field of pain research.

I began a more advanced form of research in the second year of university with professor **Marius RAICA** at the Histology department of UMFT who guided me for many years after and as a Rector of the University encouraged me to return in Timisoara as an Associate Professor.

Our work culminated in a paper in the local medical journal at the time: Timisoara Medical Journal. This was on the Histology of D-pancreatic cells explored by immunohistochemistry. This small research project opened the opportunity to participate in a competition for a scholarship grant at the University of Frankfurt. As a consequence in 2002, the second year of medical school, I went for a short summer practice at the Eddinger Institute of the Universitätsklinikum Frankfurt where I encountered and worked with professor **Karl-Heinz PLATE** the president of the German Society of Neuropathology at the time. The Edinger Institute is focused on neuropathology diagnosis and research. I therefore learned about the histology of the nervous system and its pathology. As a student I performed direct dissections of brains throughout the summer of 2002 and worked in the laboratory with neural stem cell cultures. This advanced introduction into research opened the appetite for a career in neuroscience. The relationship with professor Plate was also an important stimulus for a career in neuroscience.

Professor Plate took the time both to explain principles of neuropathology and research in neurobiology and also to introduce me to modern neurosurgical oncology by letting me participate in the diagnosis of brain tumors in the operative theater of the UniKlinik in Frankfurt together with professor **Volker SEIFERT**. This left a profound impression on me and the opportunity to see advanced surgeries for brain tumors, as well as an immediate neuropathological diagnosis, further paved the way and increased the interest of a clinical neuroscience career for me.

The relationship fostered with professor Plate and the common interest led to him offering a stipend for a one-year research scholarship from 2003 to 2004. The objective of this of this research year was to work with doctor **Stefan MOMMA** who was just arriving

from the Karolinska University in Stockholm where he had just finished his post-doctoral thesis on the angiogenesis of brain tumors.

Starting with the 4th year of medical school I began participating in the activity of the ICU department of the Timisoara County Hospital (SCJUPBT), working in fact with my father on neurological and neurosurgical patients in the ICU. This clinical research in neuroscience made me settle on the idea of a residency in neurosurgery

In my first year of residency training in neurosurgery I was in the service of professor **Constantin COSTEA**, an elderly professor at the time with great experience but towards the end of his career. This led to many discussions about surgical techniques, the way to approach patients and their pathology and in general the philosophy of surgery. After 12 months of working with professor Costea I had the opportunity for a short fellowship at Mainz University Hospital with doctor **Manfred SCHWARZ** in the service of professor **Axel PERNECZKY**. This encouraged me to seek further training abroad and I next chose to participate in a second fellowship at University of Padua at the Hospital Ca' Foncello in Treviso in Italy working with professor **Pierluigi LONGATTI** and doctor **Enzo DISTEFANO**. Doctor DiStefano was a specialist in spinal surgery and I had the opportunity to see surgical prowess in the field of spinal surgery. Professor Longatti was more interested in cranial neurosurgery and developed endoscopy techniques for brain surgery. It is needless to say that brain surgery itself was far more seductive than spinal surgery.

I wanted to work in a large neurosurgical hospital in Europe and I sought an institution with a comprehensive training program. I found it at the **Neurological and Neurosurgical Hospital in Lyon (NHL)** after a short visit in the service of professor **Marc SINDOU** during the summer of 2009. The NHL is a large European training center for neurosurgery, neurology and neuroscience in general. Its history is fascinating and it has persuaded me to do research in medical history, research that I published about the creation and development of the Neurological Hospital in Lyon by professor **Pierre WERTHEIMER**.

Starting November 2009 I worked in the NHL initially with professor Sindou. These years were focused on clinical neurosurgery, and I developed my skills for basic neurosurgery both cranial and spinal and in particular for complex tumors of the skull base. At the time the main area of interest / area of clinical research of the functional neurosurgery department of the Neurological Hospital of Lyon was cranial nerve dysfunctions in the context of neurovascular conflicts. The department was interest in the entirety of this field and several people were focusing on both the basic science behind cranial nerve dysfunctions and the clinical component of the specific syndromes resulting from neurovascular conflicts. This gave me the opportunity for some of the more interesting publications I made.

Since the departure in 2014 of professor Sindou from the NHL I had to refocus and repurpose my clinical activity and I did this with the help and guidance of professor **Patrick MERTENS** who helped me in joining a series of fellowships in the field of functional neurosurgery at the NHL.

Functional neurosurgery is a branch of neurosurgery that studies diseases of the nervous system and their treatment not by the morphological corrections but by eliminating hyperactive foci or interrupting pathways or even by correcting such dysfunctional pathways through electrical stimulation.

Sequentially year after year I had the opportunity to perform a one year fellowship in each of these branches of the field of functional neurosurgery. I worked in 2015 with professor **Marc GUENOT** in epilepsy surgery, in 2016 with professor **Stephane THOBOIS** in movement disorders surgery, in 2017 with professor **Jacques LUAUTE** on spasticity surgery and throughout all of these years with professor Mertnes in pain surgery. This allowed me to gain experience with not only with the neurosurgical techniques but also with the multidisciplinary approach specific to functional neurosurgery.

In fact, functional neurosurgery is dependent on multidisciplinary collaborations and decision making. This means that for most cases people from very different backgrounds are involved and, as already said, each individual case is treated like a distinct study. In this way, for example, working in epilepsy I had the chance to collaborate with neurologists, neurophysiologists, magnetic resonance specialists and psychologists all of whom were involved in patient care but also in active research in their respective fields.

I became interested in neurophysiology at a clinical level in 2013 when I first entertained the idea of pursuing functional neurosurgery for its own sake. With that purpose in mind I started working in the laboratory of professor **Francois MAUGUIERRE** and doctor **Catherine FISCHER**. Professor Mauguierre is well known for being one of the fathers of modern neurophysiology and is one of the chief editors of the Textbook of Neurophysiology published by the International Society of Neurophysiology. His field of interest was somatosensory evoked potentials (SSEPs) and I greatly benefited from learning directly from him. He encouraged me to start a structured scientific training. I did this as a neurophysiologist with the help of dr. **Nathalie ANDRE-OBADIA**. Dr. Obadia was the chief of the neurophysiology laboratory of the NHL after the retirement of professor Mauguierre and took great care to teach me the practical aspects of neurophysiology. This was a turning point in my career as I understood that in order to completely master a field of clinical work you need to have a very solid background in scientific research as well. For this reason, encouraged by dr. Obadia I started a research masters in neuroscience at the University of Lyon in 2015. This involved 6 months of laboratory work which I performed in the laboratory of professor **Luis GARCIA-LARREA**, director of the “Neuropain” laboratory part of the Center of Neuroscience Research of Lyon. With the help of Dr. Obadia and professor Garcia Larrea I worked on a thesis on the existence of a mismatch negativity evoked by somatosensory electrical stimulation. The laboratory I worked in focused on pain research and evoked potentials. I came in contact with personalities such as doctor **Helene BASTUJI** or professor **Roland PEYRON**.

Towards the end of my fellowship years, I tended to focus on pain medicine and, in particular, in interventional therapies for the treatment of pain. I performed pain surgeries in particular spinal cord stimulation, DREZtomy and cordotomies and intrathecal treatments. This contributed to the renewal of the pain surgery program in the NHL. This program grew from about 50 patients a year to around 250 patients a year and is now one of the more prolific programs in France.

I ended my fellowship years in 2017 and after having finished my master's thesis I encountered professor **Horia PLES**, the new chief of neurosurgery in Timisoara. He was very interested in my background in functional neurosurgery and complex brain tumors. We met at a European Association of Neurosurgical Societies Congress (EANS) in Athens in

2016 and he suggested that a return to Timisoara would offer the possibilities of an academic career and of directorship of a neurosurgery program. This was completely concordant with my initial intention of leaving the country only for a temporary period in order to train up to the level of an academic neurosurgeon and then return in my hometown. I therefore started actively working in that direction.

The first step necessary was a PhD thesis which I started with professor **Mihaela SIMU** of the neurology department in Timisoara in collaboration with professor Sindou in 2016. By the end of 2017 my research publications allowed me to be granted a doctoral title.

Next, Profesor Raica helped with the long-term decision. He was very determined to bring me back to Timisoara and to help me pursue an academic career within the UMFT. Therefore rapidly in 2019 he offered me an associate professor position at the EMFT. I therefore came back and started to be active in Timisoara in January 2021.

For the next 2 years I continued my collaboration with the Neurological Hospital in Lyon especially on the side of surgery for pain. I entered formal training as a pain physician (the medical part of pain treatment) and obtained a Pain Therapist diploma in France in 2023

Many encouraged my return to Timisoara and the University contributed significantly in the sense that it funded the material basis for a neurophysiology laboratory with capabilities in EEG, EEB and Evoked Potentials. This allowed for the creation of the **Timisoara Neuroscience Research Center** that I now direct. The research center has broad activities in the field of neurosciences from clinical neurosciences and outcome studies to neurophysiology and pain research. We are now looking into integrating a larger consortium of neurosciences in order to have a more active and productive research program.

So far, the neuroscience research center of Timisoara has already launched some solid avenues of research. These include topics of active research which I already had in Lyon such as: cranial nerve dysfunction syndromes and pain research, but also continuing historical research in neurosurgery. Obviously since neurophysiology has just been introduced in Timisoara research has already started with the objective of establishing a base of knowledge for neurophysiological research.

The work is focused on technique and instrument validation. Another field of interest is outcome of patients in various clinical settings related to clinical neurosciences. We have so far produced research about the outcome of *high-grade gliomas* after surgery and oncological treatment as well as studies on ICU outcomes and general mortality in the hospital setting. Articles are in the pipeline for publication.

Since the start of 2024 I took the position of Chief of Service of Neurosurgery in Timisoara and started a broader surgical program. In particular we started a *multidisciplinary team in neuro-oncology* in order to improve the overall outcome of patients with primary brain tumors. *Neuro-endoscopy* has been introduced at a higher level with the capabilities for endonasal transsphenoidal anterior skull base and pituitary surgery. Program by program we will attempt to restructure each of the fields in which the Timisoara Neurosurgery Department is active in.

We have maintained collaboration with CHU Lyon both at the level of the NHL and at the level of the **CRNL and Neuroscience and Cognition Doctoral School of Lyon** as part

of the development program in neurosciences. The challenge now will be to grow the numbers and the expertise of the team in such a way as to create a true center for neurosciences in Timisoara.

Over the years I have participated in many research projects having now 24 ISI publications of many types of which more than 10 as a principal author with a total cumulative impact factor of almost 60 (59,25). Having published research papers since 2015 my career-spanning ranking in Web of Science H-Index is at 10 with a total of almost 250 citations. In addition to the scientific published works I have published a monography on trigeminal neuralgia in English with Springer and several book chapters in international treaties such as Youmans and Fessler's atlas of spine surgery. In pain research I have developed a study protocol that resulted in a National Multicenter Randomized Controlled Trial on the treatment of pain in spinal cord injury patients via intrathecal infusions of Ziconotide. The trial is a registered clinical trial as NCT03942848 with the name SPIDOL and I participated as the first author of the study protocol and a principal investigator for the Lyon Center. The Trial was granted 350.000 euros by the French Ministry of Health and 35.000 from private funds.

The research we performed so far is focused on three main directions: 1, cranial nerve anatomy, 2, trigeminal neuralgia and other cranial nerve dysfunctions and 3. the treatment of chronic pain. In addition to these we have several other research preoccupations we detail in the main body of the text. One such preoccupations is the study of the history of medicine and its relationship with neuroscience and neurosurgery

Main research topics

The more significant and fundamental works I have performed were on **cranial nerve anatomy**. Being part of our service dealing with cranial nerve dysfunctions study of the anatomy and functioning of the cranial nerves was the basis of research under Pr. Sindou in the 2010s. This was studied through imaging studies aimed at finding compression of cranial nerves in patients with specific cranial nerve syndromes. Histological studies of the cranial nerves were also performed in order to characterize their myelin sheet. The nerves were monitored and all times during surgeries for that function which also allowed stimulation.

Cranial nerves are composed of many fibers that either trek from the brainstem towards the foramina in the skull base through which they exit the cranium in order to reach muscles of the head or have the reverse pathway from sensory areas in the head through the skull base and to the brainstem. In general, cranial nerves have more than one function and thus have a heterogeneous composition of fibers. These fibers originate in distinct regions of the head or from distinct nuclei in the brainstem. The path they take within the nerve is in principle influenced by their embryological development in order to reach their targets. In turn this means that there may be a preferential disposition of fibers within the nerve favored by development and the situation of stem and target structures.

We aimed in several of our studies to show that such a somatotopic organization was present within some of the cranial nerves. We were able to show that in the case of the XIth

nerve and of the Vth nerve. Both are new findings and have implications for clinical examination and surgical indications and technique. One of these studies was published in the prestigious journal Brain and was immediately confirmed with observation of other teams. The other was published in the well known Journal of Neurosurgery.

Trigeminal neuralgia has been the main focus of my research throughout the years. Many studies have been performed in the field in particular on the outcome of patients with this pathology with the study of many factors potentially influencing its outcome. The concept behind the research is to have as much predictive data as possible prior to surgery in such a way as to be able to select those patients with the highest chances of benefit from the surgical act. This is crucial since there are several surgical options and microvascular decompression, while having the best chances of a positive outcome, also carries the greatest risks and the higher toll on patients.

One of the more important studies that we performed in this field was focused on evaluating the quality of imaging in predicting the existence of a neurovascular conflict. This was published in the Journal of Neurosurgery and is one of the most cited articles we have produced with 49 WoS Citations. It shows the high but not perfect reliability of MRI to predict the presence of a conflict. There are false positive as well as false negative results. The quality of prediction however is in relation with the degree of conflict. We have presented this work in several congress.

Another major study was a long term follow up study for patients suffering from trigeminal neuralgia due to a venous neurovascular conflict. We followed 55 patients for 5 years after their microvascular decompression. Half of them had only a venous vascular conflict. Results were similar with those of patients harboring arterial conflicts. The study was published in Acta Neurochirurgica and has been cited 41 times. The article has received the prize as the best functional neurosurgery article in 2017 by the EANS, prize that I have received personally.

We discuss two other publications impacting the outcome of trigeminal neuralgia. One is on the size and shape of the petrous ridge upon which the trigeminal nerve may be angulated. The other is about arachnoid adhesions that may strangle the nerve and render decompression impossible. Both are negative outcome factors and should be sought in cases where the neurovascular conflict is not evident. The impact is important in sparing patients useless surgeries even though. The Trigeminal neuralgia work continues with studies on imaging techniques and technical details of surgeries.

The **study of chronic pain** is an intrinsic part of someone regularly performing surgery for pain. I evolved in a service where many procedures for the surgery of pain were invented and where this type of surgery was performed on a day-to-day basis. Arguably surgery for trigeminal neuralgia is part of this field as well but it is distinctly identified by the neurosurgical community as being surgery for cranial nerve dysfunction. This is mostly because of the technical peculiarities of this surgery. Surgery of pain on the other hand is the attempt to control pain by surgical means in patients with refractory pain of cancer origin or chronic neuropathic pain. A vast proportion of the population is affected by this type of pain. While only a small proportion require surgery for the control of their pain given the large

number of chronic pain patients to begin with this still represents a large number. Constant evaluation of techniques is required in order to refine them and given the difficulties to control pain and the setting we are always on the lookout for new possibilities. This means constant research in the field of chronic pain treatment is the rule and all larger services participate in studies oriented on the treatment of chronic pain.

The field has many specificities with different approaches than other clinical research and an importance of the placebo effect as well as evaluations that are very specific to the pain domain. It is therefore a learned practice to participate in pain research. I have had the opportunity to be the principal investigator in two large studies in the French population on the treatment of chronic pain.

One of them focused on the outcome of spinal cord stimulation in France through national registry kept by the companies commercializing the spinal cord stimulation stimulators. Spinal cord stimulation is used in cases of peripheral neuropathic pain that is refractory to medical treatment. It requires the implantation of an electrode on the spinal cord and a subcutaneous pacemaker connected to the set electrode. Electrical impulses are delivered to the dorsal columns activating the gate mechanism described by Wall and Melzack and modulating pain at the spinal level. Indications are various but failed back surgery syndrome is one of the main providers of patients. In this study we followed the population of all implanted spinal cord stimulators in France from the Medtronic company over a period of two years. The main outcome measure was a persistence of the decrease of pain of above 50% by the spinal cord stimulation. We found that 60% of patients maintained such an efficacy of the spinal cord stimulator. This study has had a major impact in the care of patients with chronic pain better refining the indications and allowing the continuing of reimbursement for spinal cord stimulators in France. This affects a large population of patients.

The second study involved a more niche pathology in the form of central neuropathic pain subsequent to spinal cord injury. Patients that suffer from pain that is notoriously difficult to treat. One option is the use of a calcium channel blocker acting on the synapse between the 1st and 2nd neurons on the nociceptive pathway. This is situated at the level of the dorsal horn. Such a type of calcium channel blocker exists and has been identified in the toxin of a sea snail. It effectively blocks that synapse thus reducing pain. The catch here is that this type of blocker is a large peptide that needs to reach the dorsal horn and that can be achieved only by a direct intrathecal injection. This also can be done by the implementation of an intrathecal pump. Therefore, in this study we researched the effects of intrathecal ziconotide for spinal cord injury related pain. A small series of patients that had no other option and had tried every single other means of treatment were treated by this technique. More than half of them experienced a clear benefit of 50% pain reduction over a follow up period of five years. A follow up of this study was the RCT SPIDOL Trial

These two studies are related in many ways because they assess dear frequency of complex pain treatments in patients with refractory and difficult to treat pain that is neuropathic pain of peripheral or central origin. The methods used for research are very similar in these cases and the results sought are a reduction in pain of 50%.

Both articles were well published in the European Journal of Pain with an impact factor of about 4 and have been cited frequently more than 20 times since.

A particular area of interest are **historical studies**. These rarely lead to major discoveries however sometimes looking into the evolution of ideas is necessary in order to be able to move forward entire fields of research. For me in any case it was an enlightening experience to perform a historical study on the creation and evolution of the neurological hospital in Lyon. As I described previously this is associated with a research campus focused on neuroscience. Now the three main laboratories of neuroscience within that campus are the **Institute of Cognitive Neurosciences “Marc Jeannerod”** the **Center for Research in Neuroscience of Lyon “Michel Jouvet”** and **Center for Imaging of the Living - CERMEP**. Together they constitute the **Neuroscience and Cognition Doctoral School** of the University of Lyon.

Annex 3 describes the history of the NHL in detail. It is an yet unpublished manuscript that has been added to this work since it aids in the comprehension of the evolution of the hospital and its campus as well as to the comprehension of the environment in which my career evolved.

Historical research is tedious and one needs to go into archives and interviewed people that have participated in events and review you already published literature. Fortunately for me this was an interesting endeavor because the archives I had to review were all the publications performed by the campus created by professor Wertheimer. Of such I had to research the CV's of many neuroscientists involved in the works performed in Lyon. And the actual work itself I cite over 350 papers but in fact I have reviewed almost 1000 publications performed by scientists working on the campus of the NHL. In that sense this publication is the largest review work I have ever performed And although the common theme within it is work being performed at the NHL It still is neuroscience papers that I had review and decider after careful lecture whether or not they were to be included in the main text. This required me to understand exactly what kind of research each one of the laboratory directors in Lyon performed. It is Needless to say that it was a great learning experience. It is also Needless to say that a methodology needed to be put in place in order to select which papers are worth citing. Obviously, those that were published in very high impact journals such as Nature or Science had to be included but sometimes, even oftentimes, small papers published in medium sized journals end up changing fundamental ideas about neuroscience. Ample examples are given in the text.

Development Plan

The main purpose of obtaining the Habilitation to Coordinate research is to be able to help younger generations in their endeavor to perform research and publish their results. This means offering opportunities and ideas for research in a controlled environment. This also offers the opportunity to develop ones own research and improve knowledge of biology, disease and its treatment thus creating the framework for fulfilling ones mission in an Academic Medical Career.

Motivation for a Medical Academic Career

The mission of physicians working in a university hospital environment is triple: caring for patients, educating others for patient care and furthering the knowledge about biology, diseases and their treatment. Supporting that is all the administrative work we may perform in order to better achieve our mission.

In this setting the focus on academic work appears to be essential but must be coupled with patient care. Overall the three are indissoluble in my view. It is therefore hard to say which is the *primum movens*. It is sufficient to say that the patient care mission comes ever so natural – how can one not find it the noblest of things to take care or help ones peers. In fact having grown up in a medical environment I cannot identify the moment when I identified this mission as being my own calling. To that it is sufficient to apply Socrate's dictum: "the unexamined life is not worth living" and it becomes insufficient "just" to take care of patients. Questions always arise on the appropriateness of treatments applied and on the causes of our patients maledictions and it becomes our duty to answer them.

Disseminating ones findings and sharing ones capacities to treat is as natural for a doctor as it is for a Christian to preach the good faith. It is an extension of our medical act by the actions of others. This goes on to the point of teaching the average man (general population) about their bodies and potential diseases. The administrative part is and must be just a tool and a chore – no true doctor wants to handle the money of it all – that is not to say that he doesn't necessarily want to make a profit and have a good living. Administration being a tool in itself one must not forget that it can be a powerful one and good handling of ones resources and time improves the results one gets from the core of ones work. If two patients can be treated with the same resources as one then one more can be saved but it is our mission as doctors to make sure that by dividing resources we do not condemn two instead of one. We are doctors before all. One can easily see that here again Socrates' dictum comes into play to embolden us to take a look at what we are doing and its impact. We constantly have to examine our work on all levels: clinical, educational, research and not least administrative – the worst outcome would be to perfectly manage resources only to forfeit our primary goal.

Overall we have the principle that a full medical academic career is necessarily involving teaching and research in addition to pure clinical practice. Administering all this is also a necessity but it is not a fundamentally medical act.

General Conclusions

So far, I have been involved in several fields of neuroscience. I have had the privilege to collaborate with many professors of neuroscience from several major European centers, who all participated in my education as a neuroscientist. I need to thank all of them for the comprehensive training they have offered me and for having allowed me to have a career that thankfully can be active in many fields of neuroscience.

This in turn has been reflected in my (neuroscience) publications, ranging from fields as different as neuroncology is to functional neurosurgery, however all of them remaining within the same conceptual framework as my education has provided me. Step by step I

have participated in research that is both fundamental clinical and technical. I have been privileged to be able to publish on pure anatomy subjects in journals such as my paper in *Brain* or the *Journal of Neurosurgery*. I have also had the privilege to publish papers on large international series such as those on spinal cord stimulation or the details of clinical trials for pain treatment. Not least, together with Pr. Sindou we have made several publications on several aspects of trigeminal neuralgia, culminating recently with a book on the matter. This has been impactful as I now have 20 publications with a cumulative impact factor of almost 60. . These have been cited in other papers with an H factor of at least 10. While all of this is satisfactory in many ways all this work must be continued and expanded.

First and foremost, I remain a clinician and my primary interest is the care of patients. Therefore I plan to continue active work in neurosurgery in particular in functional neurosurgery and brain tumors. These two broad fields must be developed for the benefit of the patients in the region and the country. Educating and recruiting collaborators will allow to refine and improve the entire field in Timisoara. This must also be a base for academic projects in which research and education must be closely intertwined.

Continuing research is “a sine qua non” of an academic career and clinical activity may be an impulse for such work but research in itself has an interest. Several avenues of research have been opened by my previous work and I plan to continue them. In particular in the immediate future, I will focus on studies of technique of surgery in the field of functional neurosurgery that is aimed to codify surgical gestures and offer a base for their evidence-based improvement. Some clinical studies are in the final analysis phase and will yield publications in short time but will also result in new questions about the treatment of children with spasticity disorders or trigeminal neuralgia malformations. New work is being done on the outcome of treatments for patients in Romania and in Timisoara. This will be the means for improving patient care in the long run. A neurophysiology research program is also being launched with work being performed on evoked potentials and their use in the exploration of cognitive functions.

We will continue our collaborations with the University of Lyon and the Neurological Hospital in Lyon and its associated Neuroscience and Cognition Doctoral School. We hope to be able to continue to send students to that neurocampus – and others – so that they may continue their education in clinical medicine but also in masters in neuroscience and eventually in doctoral studies in neuroscience.

All these works will be the basis of a neuroscience school that we hope to create within the Universities in Timisoara in order to give access to as many people as possible to neuroscientific training and all of its fields from the clinical to biological and cognitive research. In this way we hope to create at some point a Doctoral School of Neuroscience in Timisoara.

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