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Interview with the Expert

Autonomic Response to Sacral Nerve Stimulation for Lower Urinary Tract Dysfunction

Dr. Xavier Biardeau (FR)
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Interviewed by Dr. Glenn Werneburg (US), Editor NUN

In this month's *Interview with the Expert*, I had the pleasure of speaking with **Dr. Xavier Biardeau**, regarding his recent work on the autonomic nervous system's response to sacral nerve stimulation for lower urinary tract dysfunction. Dr. Biardeau is Associate Professor of Urology at the University of Lille, France. He obtained his Academic Degree in Neuro-Urology, Urodynamic, and Perineal Exploration under **Professor Chartier-Kastler** at Pitié-Salpétrière Academic Hospital, and his Master's Degree under Professor Amarenco from the Service de Neuro-Urologie et d'Explorations Périnéales Hôpital Tenon. He subsequently performed a research fellowship under **Dr. Jacques Corcos** at McGill University in Canada followed by a clinical fellowship in urology at University of Lille, before joining the university as faculty in 2020. He and his team have made many academic contributions in areas of the field of functional urology, with a focus on neuro-urology. Below is our interview, edited for length and clarity.

Glenn Werneburg: What is known about the mechanism of sacral neuromodulation?

Dr. Xavier Biardeau: After three decades of research, our understanding of the mechanism of action of sacral neuromodulation remains limited. The current consensus is that sacral neuromodulation primarily modulates afferent signals. However, some evidence suggests that at higher amplitudes it can also directly influence efferent pathways.

The ability of sacral neuromodulation to treat conditions such as overactive bladder, non-obstructive urinary retention and other pelvic dysfunctions, including fecal incontinence, refractory constipation and, to a lesser extent, chronic pelvic pain syndrome, highlights the complexity of its mode of action. Beyond a simple stimulation or inhibition effect, sacral neuromodulation appears to modulate neuronal activity at the cerebral and spinal levels. This modulation probably encompasses both acute and long-term effects, by promoting neuroplasticity.

GW: Prior to this study, what was known about the effect of sacral neuromodulation on the autonomic nervous system?

XB: The autonomic nervous system is recognized as a critical interface between the supramedullary structures and the lower urinary tract. However, to our knowledge, although many experts suspect its involvement in the mechanism of action of sacral neuromodulation, no data, even preliminary, have yet been published.

INUS Calendar

INUS Lectures at the Congress of the Pan Pacific Continence Society
Bali, Indonesia
September 6, 2024

INUS International Course on Neuro-Urology
Medellin, Colombia
September 27-28, 2024

INUS Lecture at the ICS Annual Congress 2024
Madrid, Spain
October 23-25, 2024

INUS Lecture at the MEDSYNERGY-IF
Virtual
November 22-24, 2024

INUS Course on "Gender Gap in Neuro-Urology"
Florence, Italy
November 23, 2024

INUS Annual Congress 2025
Zermatt, Switzerland
January 16-18, 2025

Register Here

GW: What was the impetus for the current study?

XB: The aim of this exploratory study was to determine whether heart rate variability, as a non-invasive measure of autonomic nervous system activity, could improve our understanding of the mechanism of action of sacral neuromodulation in various lower urinary tract dysfunctions. Essentially, the goal of this study was to open new avenues for research.

GW: Describe the design of the current study. What was your hypothesis?

XB: This was designed as a single-center retrospective study, conducted at Lille University Hospital, and included 50 patients who underwent a two-stage sacral neuromodulation (SNM) implantation for overactive bladder (n=28), non-obstructive urinary retention (n=21), or chronic bladder pain syndrome (n=1). We standardized the stimulation protocol applied during lead implantation under general anesthesia, sequentially stimulating each of the four contact points at the amplitude required to elicit an anal motor response. Heart rate variability parameters were retrospectively collected using the PhysioDoloris Monitor - routinely employed in our operating theaters for monitoring intra-operative nociception - and were calculated using time domain, frequency domain, and graphical methods.

We previously hypothesized that acute stimulation of a sacral root could modify the balance of the autonomic nervous system (ANS), a change that could be readily measured through heart rate variability.

GW: What were the main findings of the current study? What are its implications?

XB: We reported a significant modification in overall ANS activity and in relative parasympathetic nervous system activity (PSNS) at the time of stimulations delivered on the three contact points positioned closest to the sacral nerve root. This was accompanied with a significant increase in overall ANS activity and in relative PSNS activity only at the time of stimulation delivered on the contact point positioned closest to the sacral nerve root.

This should be interpreted in the light of previous studies reporting an increase in sympathetic nervous system (SNS) activity in women with overactive bladder and/or urge urinary incontinence, whether at rest or during bladder filling.

It is reasonable to assume that the mechanism of action of sacral neuromodulation may involve, at least in part, an increase in the relative activity of the PSNS, counterbalancing the abnormal activity of the SNS, which seems sometimes to be associated with certain lower urinary tract dysfunctions.

GW: There is some evidence that certain types of neuromodulation may play a role in reducing autonomic dysreflexia. Do you suspect the findings of your study will have any relevance to this condition?

XB: In the light of these results, it is hard not to imagine that sacral neuromodulation could one day play a role in the management of certain autonomic dysreflexia. However, in our humble opinion, this would only make sense in the management of autonomic dysreflexia linked to abnormal and/or nociceptive stimulation of pelvic afferents (and not those emanating from the lower limbs).

GW: Do you suspect, or have you any preliminary data, on whether autonomic response to sacral neuromodulation is associated with clinical outcomes?

XB: This is where the real question lies. Do these changes in the ANS activity tell us anything and are they correlated with clinical outcomes? We have not yet been able to analyze these data and this question will of course be the subject of future work.

GW: What are the limitations of the current study? What are your team's next steps?

XB: The current retrospective study was limited by a lack of standardization regarding the general anesthesia protocol, but also by the fact that the stimulation was always performed in the same order from contact point 0 to contact point 3. Furthermore, the clinical evaluation protocol was not standardized to properly assess the correlation between changes observed in ANS activity during stimulation at the time of lead implantation and clinical outcomes.

To overcome these limitations, we should soon be initiating a prospective trial, supported by a grant from Lille University Hospital.

GW: What advice do you have for junior INUS members interested in embarking on a career as an investigator with a neuro-urological focus?

XB: In many areas, as this work demonstrates, significant progress is still needed, and there remains a vast amount of research to be done.

In my view, the future belongs to those who are willing to work across disciplines. Only holistic approaches, applied with curiosity and rigorous methodology, will allow us to make significant advances.

To junior INUS members, I first suggest questioning the dogmas - while respecting our predecessors - to advance methodically in both theoretical and practical knowledge. Indeed, although these dogmas provide a common framework, they often inhibit us from exploring new pathways. In conclusion, I would like to propose a quote from Steve Jobs (Stanford, 2005): "Don't be trapped by dogma – which is living with the results of other people's thinking. Don't let the noise of others' opinions drown out your own inner voice."

Further Reading

Biardeau, X., Wojtanowski, A., Tilborghs, S., De Jonckheere, J., Vermersch, P., & De Wachter, S. (2024). Acute autonomic nervous system response to direct sacral nerve root stimulation in lower urinary tract dysfunction: A new approach to understand the mechanism of action of sacral nerve modulation. The Journal of Urology, 10-1097.

da Silva, J. B., de Abreu, R. M., Padilha, J. F., Borghi-Silva, A., Catai, A. M., & Driusso, P. (2022). Heart rate variability dynamics in women with urinary incontinence: a systematic review. International Urogynecology Journal, 33(5), 1145-1155.

De Wachter, S., Vaganee, D., & Kessler, T. M. (2020). Sacral neuromodulation: mechanism of action. European urology focus, 6(5), 823-825.

Hubeaux, K., Deffieux, X., Raibaut, P., Le Breton, F., Jousse, M., & Amarenco, G. (2011). Evidence for autonomic nervous system dysfunction in females with idiopathic overactive bladder syndrome. Neurourology and urodynamics, 30(8), 1467-1472.

INUS Congress 2025: Welcome

The 10th Anniversary meeting of the International Neuro-Urology Society



Congress Scientific Committee

Dr. Ulrich Mehnert (CH, left)
Dr. Stefania Musco (IT, center)
Dr. Jalesh Panicker (GB, right)

Venue

The 10th Anniversary INUS Annual Congress 2025 returns to Switzerland, taking place in Zermatt from January 16th to 18th, 2025. This charming town is located at the foot of the Matterhorn mountain and surrounded by the enormous, tall-snow covered mountaineering and ski region "Matterhorn glacier paradise", making it the most attractive village throughout the Alps.

Travel to Zermatt by car is not permitted. Drivers park their private automobiles in a convenient parking garage in Täsch. Zermatt can be reached by train, taxi or helicopter. There are direct trains to car-free Zermatt; the village is 3.5 hours from Zurich airport and 4 hours from Geneva airport. Travel on the Glacier Express is also possible. Lots of attractions in Zermatt are within walking distance. Getting around the village is alternatively possible by bicycle, eTaxi, or free eBus.

The congress hotel, Mont Cervin Palace, is located in the heart of the town, only 5 minutes away from the train station. No cars, but plenty of peace, clean air and a mountain spectacular view. There are nearby accommodations available.

Remember to check the Swiss government requirement for entrance to Switzerland from your country. For any further questions, please do not hesitate to contact the INUS office.

Program

The INUS Scientific Committee has prepared an outstanding program. From a young and promising sprout, INUS has matured and in 10 years of life its reputation has been established. Partnerships, workshops and other educational activities offered by INUS through a multiprofessional network of cultural and scientific collaborations are a guarantee of high-quality. The successful and very popular workshops which can never missed in the INUS Scientific program include urodynamics, neuromodulation, translational research, neuroscience and one specifically designed for nurses. For the first time we will have two new interesting workshops: one dedicated to difficult and complex clinical cases entitled "nightmare cases in neuro-urology" and one focused on the role of microbiome and phage therapy. Thanks to the creation of guideline working groups there will be two different moments within the Congress in which the collaborations among several International Societies and the comparison between professional figures will be expected and very welcome to identify the gaps and contribute to the development of universal guidance.

The INUS program will be opened celebrating the 10th anniversary of INUS with a magistral lecture presented by Prof. Madersbacher. As traditional, there will be several state-of-the-art presentations and panel discussions in combination with our scientific partnerships. Original hot topics will include red flags, risk stratifications and follow-up in neuro-urology including a journey through the different ages from childhood to elderly, challenges for neuro-urologists in LUTS after transgender surgery, interaction among the "Big 3 Bs" (bladder, bowel and bedroom), and the interface between mental health diseases and LUTS. Moreover, particular attention has been given to the multidisciplinary figures including physiotherapists, nurses and obstetricians with a session focusing on the pelvic floor rehabilitation in neuro-urological patients and one on the NLUTD management during pregnancy. Thanks to the work of the Scientific Committee and the fundamental support of all the INUS board we are confident that the program will be highly appreciated fulfilling the expectations of all of us with enjoyable and attractive moments that will be unforgettable.

Abstract submission

Submit your original abstracts by September 30th 2024. The Poster Sessions during the next INUS annual meeting in Zermatt will give the opportunity to present and share your research studies in neuro-urology with a multiprofessional expert audience. Abstract submission form and instructions are downloadable online through the INUS webpage. Please be aware that posters can only be presented in person at the INUS 2025 special poster sessions in Zermatt (Switzerland) on January 16-18th 2025. We are looking forward to your contributions!

Submit your abstract
now until Sept. 30!