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978-0-521-86692-7 - Central Pain Syndrome: Pathophysiology, Diagnosis and Management

Sergio Canavero and Vincenzo Bonicalzi

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## CENTRAL PAIN SYNDROME

Central Pain Syndrome (CPS) is a neurological condition caused by damage specifically to the central nervous system – brain, brainstem, or spinal cord. This is the only up-to-date book available on the clinical aspects (including diagnosis and therapy) of CPS management. The authors have developed a complete reference source on central pain, which includes background material, the pathophysiology of the syndrome, and diagnostic and therapeutic information. The syndrome has been a medical mystery for 100 years with no effective cure; this book turns the concept of incurability of central pain on its head, providing a rational approach to therapy based on a scientific theory.

Sergio Canavero set out to become a functional neurosurgeon after reading *Scientific American's* special issue on the brain in September 1979. He graduated *magna cum laude* and went on to gain FMGEMS certification. Finding psychosurgery impossible to pursue in Italy, he moved on to the field of pain and movement disorders, introducing extradural cortical stimulation for Parkinson's disease and stroke rehabilitation. His lifetime focus is on the nature of consciousness. With Bonicalzi, he founded the Turin Advanced Neuromodulation Group, a think tank focusing on the advancement of neuromodulation. His secondary focus is on women, a subject he discussed in his book *Donne Scoperte* (*Women Unveiled*, 2005), which attracted media interest.

Vincenzo Bonicalzi graduated *magna cum laude* and took up a career in anesthesiology, pain therapy, and intensive care. He is a senior staff member at the Department of Neurosciences at the third-largest medical facility in Italy. He is an enthusiast for medical statistics and evidence-based medicine. With Canavero, he has explored the pitfalls of modern neurointensive care.

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# CENTRAL PAIN SYNDROME

## PATHOPHYSIOLOGY, DIAGNOSIS AND MANAGEMENT

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*To my parents, for their unfailing support*

*and*

*to Serena, Marco and Francesca, wishing them a world without pain*

*To my parents, source of my past*

*and*

*to Cecilia, path of my future*

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## PREFACE (OR, THE STORY OF AN IDEA)

“The man with a new idea is a crank – until the idea succeeds.” (Mark Twain)

The story of this book goes back 15 enthusiastic years. At the end of 1991, S.C., at the time 26, was asked by C.A. Pagni, one of the past mavens of the field, to take up central pain. S.C. was back from a semester as an intern at Lyon (France) neurosurgical hospital. A dedicated bookworm, he often skipped the operating theater in favor of the local well-stocked library. In that year a paper was published by two US neurobiologists, espousing the idea of consciousness arising from corticothalamic reverberation: this paper drew his attention, as he was entertaining a different opinion as to how consciousness arises. At the beginning of 1992 he came across a paper written by two US neurologists, describing a case of central post-stroke pain abolished by a further stroke: the authors were at a loss to explain the reason.

Discoveries sometimes happen when two apparently distant facts suddenly fit together to explain a previously puzzling observation. And so it was. During a “girl-hunting” bike trip at Turin’s best-known park, a sunny springtime afternoon, the realization came thundering in. Within a short time, a name was found and so the dynamic reverberation theory of central pain was born. It was first announced in a paper published in the February 1993 issue of *Neurosurgery* and then in *Medical Hypotheses* in 1994.

In May 1992 Pagni introduced Dr. Bonicalzi, a neuroanesthesiologist and pain therapist, to S.C. Over the following years, the combined effort led to further evidence in favor of the theory, in particular a neurochemical foundation based on the discovery that propofol, a recently introduced intravenous anesthetic, could quench central pain at nonanesthetic doses (September 1992). The idea of using propofol at such dosage came from reading a paper by Swiss authors describing its use in central pruritus. The similitude between central pain and pruritus, at the time not clearly delineated in the literature, was the driving reason. In 1988 Tsubokawa in Japan introduced cortical stimulation for central pain: it was truly ad hoc, as cortex plays a major role in the theory. Happily, since 1991, the cortex has gone through a renaissance in pain research, although neurosurgical work already pointed in that direction. We soon combined three lines of research – drug

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dissection, neuroimaging and cortical stimulation data – in our effort to tease out the mechanism subserving central pain.

Central pain as a scientific concept was the product of an inquisitive mind, that of Dr. L. Edinger, a neurologist working in Frankfurt-am-Main, Germany, at the end of the 1800s. Despite being recognized by early-twentieth-century neurologists as the initiator of the idea of “centrally arising pains,” this recognition soon faded, shadowed by Dejerine and Roussy and their thalamic syndrome. At the beginning of the twenty-first century, due credit must go to the physician who deserved it in the first place, namely Dr. Edinger.

For a century, central pain has remained neglected among pain syndromes, both for a lack of pathophysiological understanding and a purported rarity thereof. Far from it! Recent estimates make it no rarer than Parkinson’s disease, which, however, commands a huge literature. Worse yet, the treatment of central pain has only progressed over the past 15 years or so and much of the new acquisitions have not yet reached the pain therapist in a rational fashion.

As we set out to write this book, we decided to review the entire field and not only expound the dynamic reverberation theory, which, as we hope to show, may well represent “the end of central pain.” It has truly been a “sweatshop work” as we perused hundreds of papers and dusted off local medical libraries in search of obscure and less obscure papers in many languages, as true detectives. We drew out single cases lost in a *mare magnum* of unrelated data and in the process gave new meaning to long-overlooked reports. We also realized that some bad science mars the field, and this is properly addressed.

The result is – hopefully – the most complete reference source on central pain in the past 70 years or so. The reader should finish the book with a sound understanding of what central pain is and how it should be treated. The majority of descriptive material has been tabulated, so that reading will flow easily. We hope this will be of help to the millions who suffer from central pain.

Special thanks go to the “unsung heroes” at the National Library of Medicine in Washington, DC, whose monumental efforts made our toil (and those of thousands of researchers around the world) less fatiguing. Thanks also to the guys behind Microsoft Word, which made the tabulations easy as pie. Also, due recognition must go to the Cambridge staff who have been supervising this project over the past two years, especially Nat Russo, Cathy Felgar, and Jennifer Percy and the people at Keyword, above all Andy Baxter and Andrew Bacon for the excellent editorial work.

*Sergio Canavero, Vincenzo Bonicalzi*  
*Turin, May 2006*