Psychosurgery
Marc Lévêque

Psychosurgery

New Techniques for Brain Disorders

Preface by Bart Nuttin
Afterword by Marwan Hariz

Springer
Preface

Neurosurgical interventions to ameliorate the suffering of desperately ill patients, suffering from a psychiatric disorder, and who cannot be helped otherwise, have caught the attention of neurosurgeons, psychiatrists, and psychologists for several decades. The title of this book, “psychosurgery,” summarizes these types of interventions in one word. Everybody understands the word, and given the history, it has positive and negative connotations. In the book it is clearly explained what is really meant by psychosurgery. In fact, a surgical intervention on the brain is performed, and the wanted effect is an improvement of pathological behavior. Unfortunately, this beneficial effect is not always obtained and sometimes one encounters adverse events.

The members of the Committee of Neurosurgery for Psychiatric Disorders, which is a committee installed by the World Society for Stereotactic and Functional Neurosurgery (WSSFN), are convinced that at this moment in time, this kind of surgery can only be performed in a multidisciplinary approach, where psychiatrists work together with neurosurgeons and psychologists. It cannot at this moment be used to improve normal function (one calls this “enhancement”) and not as prevention, but only to reduce important suffering.

It was interesting to observe that during the Toronto meeting of the WSSFN in 2009, more papers were presented talking about neurosurgery for psychiatric disorders than for movement disorders, which is opposite to what happened many years before.

Marc Lévêque succeeds in providing a detailed overview of the history of neurosurgery for psychiatric disorders. Furthermore, he explains many aspects of the neuroanatomy of emotions. This chapter makes it understandable why several neurosurgical techniques have been developed. These techniques are described in extenso, together with their results. He gives an overview of the psychiatric disorders for which psychosurgery is performed. The author describes ethical principles that remain relevant for this kind of surgery, and he looks into the future as well.

In summary, I like the book as it provides a very nice overview of psychosurgery in general. It is easy to understand for any (para)medical practitioner, but even specialists in the field may learn new things. They may also enjoy looking at
the well-known and less-known figures which illustrate the book. The French edition of the book (which I read) seems to be a success, I presume the English version (which I did not see yet) will see an even wider readership.

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Foreword

Acting on the brain, that intimate domain of mind and identity, can appear transgressive and hazardous. How do we justify this intrusion, and how do we guarantee appropriate professional practices when the procedure seems legitimate? What of a patient’s ability to formulate clear and informed consent when what they are undergoing is so unbearable that they are willing to try any therapeutic alternative, even an uncertain one? Choosing between forgoing possible succor or attempting the medical intervention is a complex and delicate process. This choice is made even more difficult by the fact that protocols are often experimental and that surgery of the brain can lead, among other things, to altered judgement, attention, and behavior: everything that constitutes a social being. The person can be profoundly altered and his dignity and quality of life negatively impacted. Even when the purpose or objective is to improve or stimulate in order to compensate for a dysfunction or regain certain functions, the procedure is not devoid of problems and risks, notably to the mental integrity of the person.

The strength of this work by Marc Lévêque devoted to psychosurgery is that it offers an in-depth analysis of the various elements, both scientific and medical, which make up this often underestimated field. His thoughtful analysis balances between radical criticisms of psychosurgery’s “inhuman or degrading treatment” and pragmatic defense of it as a “lesser evil.” This approach, which informs the reader of the extent to which this specialty has in the past been tragically obsessed with correcting behavior considered socially or morally reprehensible rather than building a rigorously scientific, humane, and ethical field of research, makes a significant contribution to the literature. Indeed, it allows the reader to grasp the social, cultural and, therefore, political factors which underpin medical and scientific decisions and can lead them to being used to buttress deviant or pernicious logics. But rather than pass summary judgement, the text strives to present the context, motives, and ideologies, which can illuminate our current paradigms of caution, efficiency, efficacy, and “over-caution.” Marc Lévêque’s book is a shining example of a curriculum in ethics, one which supports the various types of procedures today part of a reasoned psychosurgical practice, which aims to heal those whom other therapies have failed.

This work plays a dual role. First, it surveys the field drawing on scientific rigor and extensive experience to present the current state of understanding and the
latest surgical protocols. Second, it examines the criteria and conditions necessary for a justified, acceptable, and prudent practice of the specialty. One which is respectful of the patient although the context may be challenging and the therapeutic alternatives both limited and limiting. At a time when our notion of illness is shifting, our therapies are becoming more personalized and profiled, patients’ rights and preferences are increasingly being factored in, and the impact of the disease on the quality of life and personal environment of the patient is ever more important. Psychosurgery examines these issues and offers a critically useful framework. Its examination of ethical dimensions of the practices is precious as well. Concepts such as autonomy, consent, assent, and responsibility are evaluated within the context of diseases which sometimes strain these principles nearly to their breaking point. What then are the safeguards which the practice can adopt in order to protect these vulnerable patients and their families? What are the pertinent ethical guidelines to draw on and who is best able to watch for the challenges specific to this type of surgery?

During preliminary debates ahead of the vote on law no. 2011—814 of 7 July 2011 regarding bioethics, it became clear that the consequences of advances being made in neuroscience today are not being sufficiently scrutinized, whether in terms of democracy, individual freedoms, or the use of biomedicine for purposes beyond simply healing patients. Consequently, the framework it implemented seems insufficient to deal with the challenges at hand. Take for example, theories aiming to lead humanity toward a transcended state, to break with our traditions and representations, to augment living systems with heretofore unimaginable abilities and capacities. Integration of the brain with other resources such as microcomputers will upend our conception of what “humans are capable of” and will radically transform our relationship to reality and those around us. What are the moral obligations and responsibilities we should strive to adopt and defend as human beings in order to preserve the common good and our identity as humans?

Marc Lévêque gives us an opportunity to share in the sometimes demanding and troubling responsibility of helping fellow human beings suffering from illness and vulnerabilities which not only alter their quality of life but also their very being as well. He expresses with great sensitivity, subtlety, and intelligence the importance of solicitude, respect, a high-degree of competency, and societal responsibility, which have always guided the practice of medicine. For this reason, we are extremely honored to be associated with his work, which I see as a rallying cry calling for solidarity and greater understanding being put in service of patients and their relatives. The notion that, “the interests and welfare of the human being shall prevail over the sole interest of society or science,”1 is always at the forefront. Marc Lévêque gives us the possibility of learning about a scientific advance and its medical implications from its inception to the present while always

remaining vigilant as to its implications. The aim is to warn us of the danger inherent in an intervention which risks affecting the consciousness and freedom of a person if it is not used responsibly and carefully. Such situations arise when, for whatever dubious reasons and objectives, we become indifferent to the plight of a patient and lose sight of the fact that not only our neglect but also our abuse of power can endanger him. This book superbly illustrates how respect of the other can lead to a truly ethical practice of medicine.

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Preface to the French Edition

Psychosurgery is a rapidly expanding field of functional neurosurgery. This is due, on the one hand, to the considerable progress made in neurosciences, which has led to a better understanding of cerebral function; and on the other hand, to the numerous technological advances made in neurosurgery in the past few years which have enabled us to make procedures safer, more effective, and more consistent in terms of results. This is the case with deep brain stimulation. Its great therapeutic efficacy in patients undergoing treatment for neurological diseases (Parkinson’s, dystonia, and essential tremors) along with low complication rates, the absence of brain lesioning, the ability to finely modulate therapeutic effects, and reverse adverse effects make the practice a logical choice for the treatment of certain neuropsychiatric diseases refractory to standard treatments. A new chapter is beginning for this fascinating field of medicine.

A reference work such as this explaining and synthesizing the latest results and looking ahead at future clinical research possibilities is absolutely necessary.

I thank Dr. Marc Lévêque for giving me the opportunity to write this Preface and having allowed me to follow the entire writing process, which has given me new appreciation for the subject. I am certain that all practitioners in this challenging and very specialized field will share my acute interest in this well written and clearly formulated book, which contains a detailed bibliography and provides a wealth of useful and pertinent information.

Patients and their families should also find this text a useful source of information. After all, the purpose of sharing this information and, consequently, improving the understanding of the neurobiology and the treatments for neuropsychiatric diseases is to improve their lives.

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Introduction

Psychosurgery, or the surgical treatment of mental pathologies, has long been one of the most controversial fields in medicine. Today, thanks to the astounding progress made in neurosciences over the past decades and the availability of new technologies, psychosurgery, now sometimes called neuromodulation, is once again at the forefront of medicine. Deep brain stimulation, a technique initially developed in the treatment of Parkinson’s disease is now being offered to patients suffering from severe OCD, treatment refractory depression and addictions, very severe cases of anorexia nervosa, debilitating Gilles de la Tourette syndrome, and certain aggressive behavior disorders.

In the past 12 years, the number of indications has been steadily growing and functional imaging of the brain has revealed many new potential targets both at the surface and deep within the brain. Other techniques such as brain stimulation and vagus nerve stimulation are also being perfected. However, the greatest potential comes from convergence in the emerging fields of nanotechnology, biotechnology, information technology, and cognitive science, the so-called “great NBIC convergence,” which may very well revolutionize treatment for thousands of patients currently in treatment-failure.

Curiously, even though the number of scientific articles on the subject has increased exponentially over the last decade, these advances and their implications are rarely presented in the media and remain known only to neurosurgeons, psychiatrists, and neurologists. What is the reason for this discretion? First, the very small number of patients currently concerned by these techniques and the preliminary nature of the results obtained. Second, the scientific community is apprehensive of the changing and often unpredictable nature of public opinion. Indeed, it is true that the excesses of psychosurgery in the 1950s, epitomized by the tragically widespread lobotomy, have colored the public’s perception. However, current techniques have nothing in common with those of the past. The effects of deep brain stimulation are reversible, and modern lesional techniques are extremely precise with none of the deleterious effects on the brain, which lead to such serious mutilations in the personalities of patients in the 1950s. What then is the reason for the scientific community’s timidity? It may stem from fears of a backlash similar to the one experienced in the field of genetics, where the public has become increasingly wary of genetically modified products and stem cell research. In spite of these fears, research continues
unabated and is leading toward a paradigm shift. The neuroscientist and ethicist Nicolas Kopp wonders, “Should we feel very worried or even just pessimistic about the future of these technologies? No! We believe we should remain vigilant. We must understand, first, that the media play up people’s fears; second, that the public is not given enough information about the science; third, that we must remain watchful in terms of ethics and science, in particular with regards to toxicology, as well as psychology and society. The debate surrounding GMOs illustrates these considerations well”[1].

The purpose of this volume is to summarize the findings of the hundreds of articles published in journals specializing in neurosurgery, psychiatry, neuroscience, and bioethics so that everyone may have access to the information they contain, not only specialists. The content of these pages is also drawn from material presented at scientific symposia over the past 5 years, extensive interviews with practitioners and researchers, and my experience in psychiatry, general neurosurgery, functional neurosurgery, and stereotaxy.

In order to help the reader assimilate the information contained in these pages, the volume is divided into six chapters. A certain amount of repetition, particularly with regard to descriptions of the surgical techniques and the anatomical targets, is present in order to enable readers new to the subject to understand the contents of a single chapter without having read the entire volume.

Chapter 1 retraces the history of this specialty, which by design makes no distinction between the mind and the body. From extractions of the stone of madness in the Middle Ages to the tragic epidemic of lobotomies after the close of the Second World War up to the latest developments of the twenty-first century, this retrospective will help the reader understand why this specialty, in spite of strong public opposition in the past, has continued to thrive, and how current scientific research has learned from past mistakes and successes. To understand this history and to measure the extent of the progress made over the past decades, a basic knowledge of the anatomy of the brain and of the biochemical circuitry underlying emotions and their dysfunctions is essential and can be found by reading Chap. 2.

Once the scene is set, Chap. 3 presents the technical details, indications, and complications for each type of surgery according to which anatomical structure is targeted. When presenting lesional techniques, deep brain stimulation, cortical stimulation or vagus nerve stimulation, the neurophysiological mechanisms, and remaining gaps in scientific understanding are discussed specifically.

Chapter 4 reviews the major psychiatric pathologies which have already or may in the future benefit from modern advances in psychosurgery. Clinical concepts are presented alongside epidemiological data, and wherever necessary, we have included explanations on the underlying physiopathological mechanisms for clarity. Finally, the various anatomical targets already in use or currently being explored for each of these mental illnesses are reviewed.

Chapter 5 discusses autonomy, beneficence, nonmaleficence, and justice, the principles on which modern bioethics is founded, and how research and advances in psychosurgery can deviate from these principles. The various ethical safeguards
suggested or already implemented to protect an often vulnerable population are
detailed as well.

Finally, Chap. 6 contains equal measures of science-fiction and science-fact. The
astounding progress made in the fields of nanotechnology, information
technology combined with developments in biology and cognitive science pave the
way for an NBIC convergence in which every discovery leads to another. This
chain of discoveries may lead us over the next 20 years to move beyond healing
humans to augmenting them. Lozano’s team in Toronto may have stumbled across
the first instance of such possible augmentation when they accidentally increased
the memory recall capacity by stimulating the hypothalamus of a patient being
treated for obesity [2]. Similar observations have more recently been made
following stimulation of the entorhinal area (Suthana…). This move toward an
Augmented Human is discussed within the context of socio-philosophical concepts
such as meliorism and transhumanism.

Psychosurgery’s frightening potential for both good and evil has always made it
a controversial subject. In 1954, in his book Psychochirurgie et Fonctions mentales
[3], Jacques Le Beau warned that, “everything which pertains to mental func-
tioning seems to as particularly adept at raising ire as the proverbial stick in a bees’
nest.” The neurosurgeon of the Salpêtrière hospital classified the “confused and
often aggressive buzzing” of his detractors, including the psychiatrist Baruk [4]
according to three types: the first, which proclaimed on theological grounds the
impossibility of analyzing the mind, now seems antiquated. The second, which
stigmatized the lack of rigor in the clinical and statistical evaluation of results and
complications, now seems antiquated as well. The last, moral objections, today
referred to as ethical warnings, is still relevant and must garner all our attention. In
order for these ethical objections to be debated effectively, psychosurgery must be
understood not just by those in the medico-technical field. The latest information
about the major anatomical, surgical, and therapeutic principles must be available
to everyone. This book strives to not only provide answers for psychiatrists and
their patients but also to the public as a whole.

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Abbreviations

AC-PC  Anterior-Posterior Commissure
ACTH  Adrenocorticotropic Hormone
BDNF  Brain-Derived Neurotrophic Factor
BPD  Borderline Personality Disorder
CRF  Corticotropin-Releasing Factor
DBS  Deep Brain Stimulation
EEG  Electroencephalogram
FDA  Food and Drug Administration
GABA  \textit{gamma}-Aminobutyric acid
GAF  Global Assessment of Functioning
GPe  Globus Pallidus External
GPi  Globus Pallidus Internal
HFS  High-Frequency Stimulation
HPA  Hypothalamic-Pituitary-Adrenal
HRSD  Hamilton Rating Scale for Depression
MRI  Magnetic Resonance Imaging
NBIC  Nanotechnology Biotechnology Information Technology and Cognitive Science
OCD  Obsessive Compulsive Disorder
PET  Positron Emission Tomography
PTSD  Post-traumatic Stress Disorder
STN  Subthalamic Nucleus
TRD  Treatment-Refractory Depression
VNS  Vagus Nerve Stimulation
Y-BOCS  Yale-Brown Obsessive Compulsive Scale