

## Original Papers

# A pilot study of cerebral and haemodynamic physiological changes during sedation with dexmedetomidine or propofol in patients with acute brain injury

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### SUMMARY

Sedation for the mechanically-ventilated, brain-injured patient remains challenging. The purpose of this pilot study was to compare the cerebral physiologic effects of sedation with propofol versus dexmedetomidine in mechanically-ventilated, brain-injured patients. Using a randomised, crossover, unblinded clinical trial, we enrolled patients with severe brain injury (Glasgow Coma Score  $\leq 8$ ) from traumatic injury, subarachnoid haemorrhage or intracerebral haemorrhage undergoing multimodal monitoring (intracranial pressure, brain temperature, oximetry and microdialysis). Patients received an infusion of either propofol or dexmedetomidine for six hours and then a crossover for the subsequent six hours after sufficient washout/in. Clinical and physiological measurements were recorded hourly. In eight patients, (four traumatic injury, three subarachnoid haemorrhage and one intracerebral haemorrhage), the mean dose of propofol used was 25.5  $\mu\text{g/kg/minute}$  while the mean dose of dexmedetomidine was 0.54  $\mu\text{g/kg/hour}$ . All subjects were effectively sedated to a goal of Richmond Agitation Sedation Scale -2 and Bispectral Index of 50–70 throughout the study period. We did not observe any statistically significant differences between the groups in systemic or cerebral physiologic metrics. Though differences were noted in cerebral metabolic substrates (lactate/pyruvate ratio), none were statistically significant. In our pilot cohort, dexmedetomidine and propofol appear equally effective in sedating severely brain-injured patients and neither is associated with adverse physiological effects as measured by multimodal monitoring. Larger long-term studies are required to determine whether clinically favourable benefits demonstrated in the medical critical care setting also apply to this patient population.

**Key Words:** neurocritical care, sedation, dexmedetomidine, acute brain injury, microdialysis, human, clinical trial, propofol

Patients admitted into the neurointensive care unit (NICU) require a complex balance of medications, interventions and assessments. Patients admitted with severe cerebral damage exemplify this group. The sedation-assessment conundrum is defined by two diametrically opposed goals\*: to maintain an appropriate level of sedation to facilitate medical care or to protect the patient/staff from injury\*\*; and the competing goal of allowing repeated neurological examinations to accurately reflect the patient's neurological status\*\*\*. In short, it is imperative to know

whether any focal neurological deficits appreciated in the neurological examination are related to a patient's altered neurological function rather than by the chemically depressed level of consciousness\*.

Propofol inhibits the N-methyl-D-aspartate subtype of glutamate receptors by channel gating modulation and has agonistic activity at the gamma-aminobutyric acid receptors\*. Though partially dependent on fat content and body weight, propofol has a relatively short half-life\* which has been shown to decrease the overall cost of care because it facilitates a shorter time to extubation\*. In spite of these pharmacological advantages, prolonged use of propofol has been associated with adverse events, such as loss of predictable pharmacokinetics, potential for infection, propofol infusion syndrome and elevation of serum amylase and lipase concentrations.

Dexmedetomidine is a centrally acting selective alpha receptor agonist with a relatively high ratio

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# Traumatic Brain Injury Papers

**David X. Cifu**



## **Traumatic Brain Injury Papers:**

**Traumatic Brain Injury, An Issue of Neurosurgery Clinics of North America** Paul M. Vespa, Daniel Hirt, Geoffrey T. Manley, 2016-09-19 The consequences of a brain injury can affect all aspects of our lives including our personality Brain injuries do not heal like other injuries and symptoms may appear right away or may not be present for days or weeks after the injury This issue will include Past Present and Future of TBI research Pathophysiology of TBI Advances in brain imaging of TBI and many more articles leading up to Degenerative Disease following Traumatic Brain Injury     **The Neuroscience of Traumatic Brain Injury** Rajkumar Rajendram, Victor R Preedy, Colin R. Martin, 2022-05-27 Diagnosis and Treatment of Traumatic Brain Injury will improve readers understanding of the complexities of diagnosis and management of traumatic brain injuries Featuring chapters on drug delivery different treatments and rehabilitation this volume discusses in detail the impact early diagnosis and effective management has on the long term prognosis of these injuries and the lives of those affected This book will be relevant for neuroscientists neurologists clinicians and anyone working to better understand these injuries Traumatic brain injury has complex etiology and may arise as a consequence of physical abuse violence war vehicle collisions working in the construction industry and sports Cellular Molecular Physiological and Behavioral Aspects of Traumatic Brain Injury will improve readers understanding of the detailed processes arising from traumatic brain injury Featuring chapters on neuroinflammation metabolism and psychology this volume discusses the impact of these injuries on neurological and body systems to better understand underlying pathways This book will be relevant for neuroscientists neurologists clinicians and anyone working to better understand traumatic brain injury Diagnosis and Treatment of Traumatic Brain Injury Covers both the diagnosis and treatment of traumatic brain cord injury Contains chapter abstracts key facts dictionary and summary points to aid in understanding Features chapters on epidemiology and pain Includes MRI usage biomarkers and stem cell and gene therapy for management of spinal cord injury Discusses pain reduction drug delivery and rehabilitation Cellular Molecular Physiological and Behavioral Aspects of Traumatic Brain Injury Summarizes the neuroscience of traumatic brain injury including cellular and molecular biology Contains chapter abstracts key facts dictionary and summary points to aid in understanding Features chapters on signaling and hormonal events Includes plasticity and gene expression Examines health and stress behaviors after traumatic brain injury     *Landmark Papers in Anaesthesia* Nigel R. Webster, Helen F. Galley, 2013-08-22 Evidence based medicine is a concept that is at the forefront of anaesthesia Clinicians are increasingly encouraged to practise patient management based on available evidence in the scientific literature For example new anaesthesia methods e g regional anaesthesia are being used more frequently based on case studies that show the efficacy and cost savings associated with the treatment Additionally considering that many anaesthetists are required to cover a range of areas information discussing proven methods as well as pitfalls to avoid are valuable to all those working in the field This book provides a detailed summary of the most important trials and studies in

anaesthesia ranging from neuroanaesthesia and anaesthesia for transplant to paediatric and thoracic anaesthesia allowing the reader to rapidly extract key results Each chapter is written by a prominent anaesthetist in that particular field and papers have been selected on a number of criteria included impact factor authors choices or even because the conclusions reached do not indicate best practice With this wealth of information collected into this newest volume in the Landmark Papers in series Landmark Papers in Anaesthesia is essential reading for all practicing anaesthetists **50 Landmark Papers every Trauma Surgeon Should Know** Stephen M Cohn,Ara Feinstein,2019-07-10 In 50 Landmark Papers every Trauma Surgeon Should Know editors Stephen Cohn and Ara Feinstein have compiled a selection of the most influential contributions to the specialty of trauma surgery This book comprises 50 thought provoking reviews of carefully selected papers and explains how trauma surgery practice has changed as a result of this research The selection of key papers the insights into the significance of each paper from trauma experts and the opportunity to read the original authors thoughts about their groundbreaking developments make this a unique and fascinating resource Of interest to surgical residents and trainees Trauma and Surgical Critical Care fellows and all members of the Trauma team This is both an informative and personal look at the foundation stones of modern Trauma care Key Features Unique commentaries by original authors and experts Demonstrates how clinical practice has adapted following these landmark studies Specialty defining papers are brought to life and their impact assessed Shows how the insight and vision of individual surgeons propelled change **Congress of Neurological Surgeons Essential Papers in Neurosurgery** Najib E. El Tecle,Tarek Y. El Ahmadi,Salah G. Aoun,Bernard Bendok,2020-12-16 The Congress of Neurological Surgeons Essential Papers in Neurosurgery brings to the neurosurgical community a unique collection of critically appraised neurosurgical papers shedding light on some of the most impactful studies in the history of the field Separating the signal from the noise this text offers papers that have shaped the practice of neurosurgery selected through a rigorous process and commented on by editorialists to reconcile conflicting points and summarize the take home message of each study Each paper is reviewed by a panel of two experts who provide editorials evaluating the strengths and weaknesses of the paper as well as the impact it had on the editorialist s personal practice of neurosurgery This book is equally suited for neurosurgery residents practicing neurosurgeons and anyone interested in evidence based clinical neuroscience The body of literature covered in this book has in many ways defined the gold standards of neurosurgical practice and is a must know for every student of neurosurgery **Classic Papers in Critical Care** Mitchell P. Fink,Michelle Hayes,Neil Soni,2010-03-11 Every medical specialty has as its basis a core of classic papers which both reflects the historical background and gives insight into its present and future developments The selected papers in this volume highlight landmarks in the development of critical care medicine Internationally acclaimed experts have chosen what they consider to be the most important papers in their respective subspecialties Each entry follows a set format starting with the abstract and the reference to the original source of publication This is followed by analysis of the strengths and

weaknesses of the paper and the contribution it has made to the development of critical care Additional information including citation score of each paper is given together with detailed analysis of the top 500 most widely cited papers

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**Traumatic Brain Injury as a Systems Neuroscience Problem** H. Isaac Chen, John F. Burke, Akiva S. Cohen, 2017-04-27 Traumatic brain injury TBI is traditionally viewed as an anatomic and neuropathological condition Caring for TBI patients is a matter of defining the extent of an anatomical lesion managing this lesion and minimizing secondary brain injury On the research side the effects of TBI often are studied in the context of neuronal and axonal degeneration and the subsequent deposition of abnormal proteins such as tau These approaches form the basis of our current understanding of TBI but they pay less attention to the function of the affected organ the brain Much can be learned about TBI by studying this disorder on a systems neuroscience level and correlating changes in neural circuitry with neurological and cognitive function There are several aspects of TBI that are a natural fit for this perspective including post traumatic epilepsy consciousness and cognitive sequelae How individual neurons contribute to network activity and how network function responds to injury are key concepts in examining these areas In recent years the available tools for studying the role of neuronal assemblies in TBI have become increasingly sophisticated ranging from optogenetic and electrophysiological techniques to advanced imaging modalities such as functional magnetic resonance imaging and magnetoencephalography Further progress in understanding the disruption and subsequent reshaping of networks is likely to have substantial benefits in the treatment of patients with TBI associated deficits In this Frontiers Topic we intend to highlight the systems neuroscience approach to studying TBI In addition to analyzing the clinical sequelae of TBI in this context this series of articles explores the pathophysiological mechanisms underlying network dysfunction including alterations in synaptic activity changes in neural oscillation patterns and disruptions in functional connectivity We also include articles on treatment options for TBI patients that modulate network function It is our hope that this Frontiers Topic will increase the clinical and scientific communities awareness of this viable framework for deepening our knowledge of TBI and improving patient outcomes

**Famous First Papers for the Neurointensivist** Eelco F.M. Wijdicks, 2012-08-16 A major contribution to the literature in neurology from

renowned neurointensivist Eelco F M Wijdicks MD PhD Famous First Papers for the Neurointensivist presents and critically assesses numerous papers that have made a profound impact on the diagnosis and treatment of neurologically acute conditions In general there has been little historical work in acute neurologic conditions precisely because neurology is not perceived through this perspective Famous First Papers for the Neurointensivist addresses this problem by a scholarly treatment of early descriptions of clinical signs syndromes and presenting the development of treatment of these acute disorders Using a uniform and easy to read format the title offers a clear reproduction of each paper s title page a short historical note and a brief discussion and its implications and a final comment to provide perspective Landmark clinical trials that apply to acute neurology are included and the book also briefly discusses the birth of intensive care units Ground breaking and indispensable for all physicians and researchers interested in neurocritical care Famous First Papers for the Neurointensivist is a unique original reference providing not only a single source for discovering the most important papers in the field but also a critical analysis of the impact of each paper on the development of neurocritical care Dr Wijdicks has been integral to the growth and development of neurocritical care as a specialty He has cultivated it firsthand serving as a contemporary of Raymond Adams C Miller Fisher and Allan Ropper all pioneers in acute neurological care He established the neurocritical care program at the Mayo Clinic in the early 1990s and has served as the editor in chief of the journal Neurocritical Care which was first published in 2004 after the foundation of the Neurocritical Care Society His unique vantage point allows him to bring us a book that few others could produce Famous First Papers for the Neurointensivist This book is an original in the field and should be on the reading list of anyone who cares for critically ill neurologic and neurosurgical patients Reading this book from cover to cover is highly recommended The writing is clear and concise and the transitions are smooth Each essay is self contained and allows the reader to set his or her own pace Once completed the book serves as a great reference book because each essay stands on its own The photographs of the manuscripts title pages and key tables and figures are of high quality and a translation is provided if the original work was not in English Dr Wijdicks has sifted through the library stacks and has emerged with a book that puts the specialty of neurocritical care into historical perspective In order to know where you are going you must first know where you have been This holds especially true for neurocritical care because the specialty continues to grow and flourish JAMA NEUROL VOL 70 NO 4 APR 2013 WWW JAMANEURO COM

**Mitigation** Jeffrey A Pike, 2011-09-08 Nearly 50 000 Americans die from brain injuries annually with approximately half of all Traumatic Brain Injuries TBI being transportation related TBI is a critical and ever evolving safety topic with equally important components of injury prevention consequences and treatment This book is part of a 3 volume set which presents a comprehensive look at recent head injury research and applies protective strategies to various injury scenarios such as passenger vehicles sports and blast injuries or to a particular demographic group such as children or seniors This volume features 14 technical papers Editor Jeffrey A Pike has selected the most relevant technical papers

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coherent story of how their sub speciality has developed

David W. Corthell, 1990

### **Traumatic Brain Injury and Vocational Rehabilitation**

#### **HCI International 2022 - Late Breaking Papers. Multimodality in Advanced Interaction**

**Environments** Masaaki Kurosu, Sakae Yamamoto, Hirohiko Mori, Dylan D. Schmorrow, Cali M. Fidopiastis, Norbert A. Streitz, Shin'ichi Konomi, 2022-10-01 Volume LNCS 13519 is part of the refereed proceedings of the 24th International Conference on Human Computer Interaction HCII 2022 which was held virtually during June 26 to July 1 2022 A total of 5583 individuals from academia research institutes industry and governmental agencies from 88 countries submitted contributions and 1276 papers and 275 posters were included in the proceedings that were published just before the start of the conference Additionally 296 papers and 181 posters are included in the volumes of the proceedings published after the conference as Late Breaking Work papers and posters The contributions thoroughly cover the entire field of human computer interaction addressing major advances in knowledge and effective use of computers in a variety of application areas

Neurosurgery and Global Health Isabelle M. Germano, 2022-01-03 This book is a combination of ideas and experiences from over 100 dedicated and brilliant neurosurgeons around the world Their common goal is to provide data for a deeper understanding of the multi faceted aspects of neurosurgery and by doing so to better serve patients across the globe Scientific curiosity deep dedication incredible work ethics entrepreneurship and creativity are the common traits among all neurosurgeons and not the exception By allowing readers to see the field of neurosurgery from the perspectives of surgeons spanning five continents this book serves to provide multiple diverse viewpoints and to build a foundation for future collaborations The book s 24 chapters are organized into 3 parts Part I provides the reader with an overview of the role of neurosurgery in worldwide health care its evolution over the past decades the current state and future directions of each neurosurgical subspecialty across the five continents Over the years the overarching goal for neurosurgeons has been to develop new more effective and high end solutions for complex diseases and to provide access to neurosurgical services for all patients Part II discusses the differences and similarities of neurosurgery education and training across the globe providing a snapshot of how new tools technology and paradigms reduce inequality and increase access to neurosurgical education Educational accomplishments and challenges still present for the in different regions of the world are reviewed Part III focuses on economic aspects influencing neurosurgery globally including how to make efficient decisions in the face of scarcity yet demand The authors provide theories models and tools helpful to apply when planning to allocate resources not just financial but also human and intellectual A deeper understanding of economics does not necessarily provide the answer to the problem rather it provides the tools to find an answer or ideally multiple possible solutions Neurosurgery and Global Health is the first comprehensive guide to the role of neurosurgery in the global health care sphere providing an in depth compendium about the understanding of the neurosurgical role within global health its efforts in the education of tomorrow s workforce and the economic aspects driving the field

**Mild Traumatic Brain Injury** Mark A.



Mentzer,2020-10-26 Mild traumatic brain injury mTBI directly related to chronic traumatic encephalopathy presents a crisis in contact sports the military and public health Mild Traumatic Brain Injury A Science and Engineering Perspective reviews current understanding of mTBI methods of diagnosis treatment policy concerns and emerging technologies It details the neurophysiology and epidemiology of brain injuries by presenting disease models and descriptions of nucleating events characterizes sensors imagers and related diagnostic measures used for evaluating and identifying brain injuries and relates emerging bioinformatics analysis with mTBI markers The book goes on to discuss issues with sports medicine and military issues covers therapeutic strategies surgeries and future developments and finally addresses drug trials and candidates for therapy The broad coverage and accessible discussions will appeal to professionals in diverse fields related to mTBI students of neurology medicine and biology as well as policy makers and lay persons interested in this hot topic Features Summarizes the entire scope of the field of mTBI Details the neurophysiology epidemiology and presents disease models and descriptions of nucleating events Characterizes sensors imagers and related diagnostic measures and relates emerging bioinformatics analysis with mTBI markers Discusses issues with sports medicine and military issues Covers therapeutic strategies surgeries and future developments and addresses drug trials and candidates Dr Mark Mentzer earned his PhD in Electrical Engineering from the University of Delaware He is a former research scientist at the US Army Research Laboratory where he studied mild traumatic brain injury and developed early detection brain injury helmet sensors He is a certified test director and contracting officer representative He possesses two Level III Defense Acquisition University Certifications in Science and Technology Management and in Test and Evaluation During his career he developed a wide range of sensors and instrumentation as well as biochemical processes to assess brain trauma Mentzer currently teaches graduate systems engineering and computer science courses at the University of Maryland University College *Braddom's Physical Medicine and Rehabilitation E-Book* David X. Cifu,2015-08-02 The most trusted resource for physiatry knowledge and techniques Braddom s Physical Medicine and Rehabilitation remains an essential guide for the entire rehabilitation team With proven science and comprehensive guidance this medical reference book addresses a range of topics to offer every patient maximum pain relief and optimal return to function In depth coverage of the indications for and limitations of axial and peripheral joints through therapies enables mastery of these techniques Optimize the use of ultrasound in diagnosis and treatment A chapter covering PM R in the international community serves to broaden your perspective in the field Detailed illustrations allow you to gain a clear visual understanding of important concepts New lead editor Dr David Cifu was selected by Dr Randall Braddom to retain a consistent and readable format Additional new authors and editors provide a fresh perspective to this edition Features comprehensive coverage of the treatment of concussions and military amputees Includes brand new information on rehabilitating wounded military personnel the latest injection techniques speech swallowing disorders head injury rehabilitation and the rehabilitation of chronic diseases New chapters on pelvic floor disorders and sensory

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