



Macquarie
Neurosurgery

Academic & Research Report 2020

January – December 2020

Vol. II



MQ Health

MACQUARIE UNIVERSITY
HEALTH SCIENCES CENTRE

www.mqneurosurgery.com.au

Macquarie Neurosurgery is one of Australia's largest academic neurosurgery groups. Macquarie Neurosurgery (MQN) includes 9 practicing neurosurgeons and 1 emeritus neurosurgeon (Prof Michael Morgan) who are dedicated to perfecting their clinical and neurosurgical skills, as well as educating future neurosurgeons and leading breakthrough research.

Whilst 2019 was a stellar year of achievements for our group, as clearly demonstrated in our previous report (find it at the following webpage:

https://www.mq.edu.au/_data/assets/pdf_file/0008/925478/MQN-Academic-and-Research-Report-2019.pdf),

2020 has been a challenging year. The social and professional disruption caused by the COVID-19 world pandemic has limited the clinical and elective surgical activities of a great part of the surgeons and hospitals around the world, including Macquarie Neurosurgery. In spite of this, the challenging times have triggered new solutions that help us get ahead of the events. All the academic activities over the last year have migrated to platforms on the Internet. For a few months, all the non-urgent patients were consulted via tele-consultation. Surgical activity has had a considerable drop in the period March-September 2020. The invitation of external speakers to deliver lectures within our Visiting Professor Program has also dropped down. Wet lab research and any research involving face-to-face experiments have also been limited in a considerable way. Workshops, like the successful ones of the previous years on brain anatomy, neuro-oncology and cerebrovascular neurosurgery, had been cancelled.

Nevertheless, the academic and research activity has continued, including research presentations. Teaching and learning opportunities have continued as usual, although migrated to our weekly teleconferences. The research involving remote analysis and computational modelling, such as the ones performed within the Computational NeuroSurgery (CNS) Lab, have even intensified during the period of lockdown. Moreover, a new hybrid service (clinics, research and surgery) for Pain Neuromodulation has been established, thanks to the dedicated collaboration with Pain Specialist A/Professor Tillman Boesel, where new techniques in the field were introduced first at Macquarie University Hospital (including motor cortex stimulation and new hybrid operations for spinal cord stimulation).

With 24 scientific publications in international peer-reviewed journals, several invitations to deliver lectures at national and international conferences in the fields of neurosurgery and neurosciences, and some awards and grants, totaling more than 1.1 million dollars in research funds in 2020,

Macquarie Neurosurgery has continued to show its role of paramount importance in the Australian landscape of neurosurgery and academic research.

This diversity of scope, translational research and pioneering achievements are demonstrations of Macquarie Neurosurgery's leadership role in the MQ Health paradigm of *Heal, Learn and Discover*.

Sadly enough, this is also the last report with contributions from A/Prof Andrew Davidson, who has decided to continue his professional activity in Melbourne since January 2021. Although I also feel that our collaborations will continue over the next future. We wish Andrew all the best for his new life experience and professional journey.

In this report, the main academic and scientific achievements of 2020 are summarised, to document our achievements even in the Pandemic environment, in order to trigger new exceptional results and collaborations going forward in 2021.

Professor Antonio Di Ieva

Academic Program Co-Ordinator, Macquarie Neurosurgery

TABLE OF CONTENTS

PUBLICATIONS	5
CONTRIBUTIONS, INTERVIEWS AND NON-PEER REVIEWED PUBLICATIONS.....	8
BRAIN SCHOOL	9
INVITED LECTURES & WEBINARS	10
RESEARCH GRANTS & AWARD.....	11
NEW RESEARCHERS/STUDENTS.....	11

PUBLICATIONS

- **Di Ieva A**, Magnussen JS, McIntosh J, Mulcahy MJ, Pardey M, Choi C. [Magnetic Resonance Spectroscopic Assessment of Isocitrate Dehydrogenase Status in Gliomas: The New Frontiers of Spectroscopy in Neurodiagnostics.](#) *World Neurosurgery* **133:e421-427, 2020**
- Berliner J, Hemley S, Najafi E, Bilston L, **Stoodley M**, Lam M. [Abnormalities in spinal cord ultrastructure in a rat model of post-traumatic syringomyelia.](#) *Fluids Barriers CNS* **17(1):11, 2020**
- Namboodiri D, Ng H, Zala A, Magnussen J, **Davidson A**, Champion B, Preda V. [Macrogonadotropinoma, a venous thromboembolic event and asymptomatic extensive periventricular white matter changes in a patient with Klinefelter Syndrome.](#) *Clinical Case Reports* **8:675-679, 2020**
- Dai X, Huang L, Qian Y, Xia S, Chong W, Liu J, **Di Ieva A**, Hou X, Ou C. [Deep learning for automated cerebral aneurysm detection on computed tomography images.](#) *Int J Comput Assist Radiol Surg* **15(4):715-723, 2020**
- Simons M, Rapport F, Zurynski Y, Cullis J, **Davidson A**. [What are the links between evidence-based medicine and shared decision-making in training programs for junior doctors? A scoping review protocol.](#) *BMJ Open* **10:e037225, 2020**
- Gauden AJ, McRobb LS, Lee VS, Subramanian S, Moutrie V, Zhao Z, **Stoodley MA**. [Occlusion of animal model arteriovenous malformations using vascular targeting.](#) *Transl Stroke Res* **11(4):689-699, 2020**
- Prabhu S, Mukhopadhyay S, Gooneratne C, **Davidson A**, Liu G. [Molecularly imprinted polymer-based detection of creatinine towards smart sensing.](#) *Medical Devices & Sensors* **3(6):e10133, 2020**
- Jang K, Rosenfeld JV, **Di Ieva A**. [Paulus of Aegina and the Historical Origins of Spine Surgery.](#) *World Neurosurg* **133:291-301, 2020**
- Jang K, Russo C, **Di Ieva A**. [Radiomics in gliomas: clinical implications of computational modeling and fractal-based analysis.](#) *Neuroradiology* **62(7):771-790, 2020**
- Liu S, Shah Z, Sav A, Russo C, Berkovsky S, Qian Y, Coiera E, **Di Ieva A**. [Isocitrate dehydrogenase \(IDH\) status prediction in histopathology images of gliomas using deep learning.](#) *Sci Rep* **7;10(1):7733, 2020**

- Policarpov D, Campbell D, McRobb L, Wu A, Lund M, Lu Y, Deyev S, **Davidson A**, Walsh B, Zvyagin A, Gillatt D. [Near-infrared molecular imaging of glioblastoma by Miltuximab ® IRDye800CW as a potential tool for fluorescence-guided surgery.](#) *Cancers* 12(4):984, 2020
- Li Ching Ng A, McRobb LS, White SJ, Cartmill JA, Cyna AM, **Seex K**. [Consent for spine surgery: an observational study.](#) *ANZ J Surg*, doi: 10.1111/ans.16348
- Eibach S, Steinfort B, **Di Ieva A**. [Delayed Contralateral Trigeminal Neuralgia After Microvascular Decompression and Postoperative Changes in Venous Outflow.](#) *World Neurosurg* 140:107-108, 2020
- Eibach S, Steinfort B, **Di Ieva A**. [In Reply to the Letter to the Editor Regarding "Delayed Contralateral Trigeminal Neuralgia After Microvascular Decompression and Postoperative Change in Venous Outflow".](#) *World Neurosurg* 142:564, 2020
- Eibach S, Pang D. [Do junctional neural tube defect and segmental spinal dysgenesis have the same pathoembryological background?](#) *Childs Nerv Syst* 36(6):1095-1096, 2020
- Gao Y, Xiao X, Han B, Li G, Ning X, Wang D, Cai W, Kikinis R, Berkovsky S, **Di Ieva A**, Zhang L, Ji N, Liu S. [Deep Learning Methodology for Differentiating Glioma Recurrence from Radiation Necrosis Using Multimodal Magnetic Resonance Imaging: Algorithm Development and Validation.](#) *JMIR Med Inform* 17;8(11):e19805, 2020
- Eibach S, Pang D. [Junctional neural tube defect.](#) *J Korean Neurosurg Soc* 63(3):327-337, 2020
- Eibach S, Moes G, Hou YJ, Zovickian J, Pang D. [New surgical paradigm for open neural tube defects.](#) *Childs Nerv Syst*, 2020
- Ou C, Chong W, Duan CZ, Zhang X, **Morgan M**, Qian Y. [A preliminary investigation of radiomics differences between ruptured and unruptured intracranial aneurysms.](#) *Eur Radiol Oct 2020*, doi: 10/1007/s00330-020-07323-3
- Subramanian S, Zhao Z, Faqih F, Grau GE, Combes V, Inglis DW, Moutrie V, **Stoodley MA**, McRobb LS. [Targeting of externalized αB-crystallin on irradiated endothelial cells with pro-thrombotic vascular targeting agents: Potential applications for brain arteriovenous malformations.](#) *Thromb Res.* 2020 May;189:119-127
- Johnston BJ, O'Donnell JM, Manuguerra M, **Davidson AS**. [Test-retest reliability of touchscreen DriveSafe DriveAware.](#) *Aust Occup Ther J*, doi.org/10.1111/1440-1630.12706

- Lloyd RA, Butler JE, Gandevia SC, Ball IK, Toson B, **Stoodley MA**, Bilston LE. *Respiratory cerebrospinal fluid flow is driven by the thoracic and lumbar spinal pressures.* *J Physiol* 598(24):5789-5805, 2020
- Jeffrey RL, **Stoodley MA**. *Management of Chiari in pregnancy.* *J Clin Neurosci* S0967-5868(20)31577-0, 2020
- Ganko R, Rodriguez M, Magnussen J, Simons M, Myint E, **Assaad N**. *Do prophylactic steroids prevent chemical meningitis in surgery for epidermoid cysts? Case report and literature review.* *Surgical Neurology International* 11:472, 2020.

Contributions, interviews and non-peer reviewed publications

- Russo C, Liu S, Di Ieva A. [Spherical coordinates transformation pre-processing in Deep Convolution Neural Networks for brain tumor segmentation in MRI](#). *arXiv:2008.07090, 2020*
- Russo C, Liu S, Di Ieva A. [Impact of spherical coordinates transformation pre-processing in Deep Convolutional Neural Networks for brain tumor segmentation and survival prediction](#). *arXiv:2010.2010.13967, 2020*
- Di Ieva A, Russo C, Le Reste PJ, Magnussen JM, Heller G. [Advanced computational and statistical multiparametric analysis of Susceptibility-Weighted Imaging to characterize gliomas and brain metastases](#). *bioRxiv doi.org/10.1101/2020.04.24.060830*
- Davidson A (Reviewer). *Understanding Brain Tumours – A guide for people with brain or spinal cord tumours, their families and friends*. **Cancer Council Australia, 2020**
- *Spotlight on Research & Innovation*, including AI, in surgery: [Surgical News](#), the magazine of the Royal Australasian College of Surgeons (RACS), pages 9-16, January-February 2020. The issue includes an article (@page 14) on the John Mitchell Crouch Fellowship 2019, awarded to Prof Di Ieva, who used it to found the Computational NeuroSurgery Lab.
- *Interview to Prof Di Ieva: New precision pictures improve diagnosis and treatment of brain diseases*: <https://lighthouse.mq.edu.au/article/june-2020/new-precision-pictures-improve-diagnosis-and-treatment-of-brain-diseases2>
- *Interview to Prof Di Ieva on brain cancer*: <https://www.stabiopharma.com/index.php?q=brain-tumour-awareness-month-2020-prof-antonio-di-ieva.html>
- *Interview to Prof Di Ieva on La Fiamma* (in Italian), the Australian newspaper of the Italian Community: https://lafiamma.com.au/news/covid-19-basta-teorie-del-complotto-55201/?fbclid=IwAR0hgeZBNr7tcZqzbJrdMuFCZNuYqd2W6g6-RC-Q9IxMH8nXbx-8o6N_naE
- *Articles on 3D exoscopy and AI in neurosurgery in the Macquarie University Hospital magazine Frontier*: https://muh.org.au/wp-content/uploads/2020/01/frontier_summer_2020.pdf?fbclid=IwAR0Y7eOLAYdZ1cSm3pmHaxtJFVTzJpGccQzHiyeiD8z6EGp2Nn19JuW0xrQ

- *Invitations to Prof Di Ieva and Prof Stoodley to peer review papers submitted to the following journals: Neurosurgery, Journal of Neurosurgery, The Lancet, The Lancet Diabetes and Endocrinology, World Neurosurgery, Acta Neurochirurgica, Journal of Clinical Neurosciences, Neurosurgical Review.*

BRAIN SCHOOL

- **Mary Simons, 13 February 2020**
Library orientation and search strategies
- **Antonio Di Ieva, Multiple dates**
WHITE MATTER(s) [Part I, II, III and IV]: Neuroanatomy of the white matter, tractography and principles of connectomics in neurosurgery
- **Antonio Di Ieva, 16 and 23 July 2020**
Vestibular schwannomas: Anatomy, physiopathology, surgery and radiosurgery.
- **Candice Delcourt, 29 August 2019**
Intracranial hemorrhage: Past, present and future
- **Antonio Di Ieva, multiple dates**
Neuroanatomy for Neurosurgery scholars
- **John Magnussen, 12 November 2020**
Neuroimaging: MRI sequences and multimodal imaging

- **Visiting Professor Program: Dr Michael Sughrue, 3 December 2020**
Connectomics and the future of brain medicine

INVITED LECTURES & WEBINARS

- School of Medicine, University of Notre Dame, Sydney. *Transhumanism: A medical impact example*. **Di Ieva A.** 17 June 2020
- Rural Clinical School of Medicine lecture: *The Spine*. **Di Ieva A.** 29 June 2020.
- RACGP Webinar. *Concussion: A primer for GPs*. **Di Ieva A, Mobbs R.** 4 August 2020
- HealthShare webinar for GPs: *Brain and Skull Base Tumours, Cerebrospinal fluid disturbances*. **Di Ieva A, Stoodley M.** 6 August 2020
- Webinar for GPs. *The new frontiers of functional neurosurgery in the management of “intractable” pain and brain tumours – CSF disturbances*. **Di Ieva A, Stoodley M.** 3 September 2020
- International Spinal Neurosurgery Operative Course (virtual course from the UK): *Idiopathic Syringomyelia*. **Stoodley M.** 27 September 2020
- [4th Workshop of the Centre for Elite Performance, Expertise and Training \(CEPET\), Macquarie University - Medical Expertise online workshop](#). *Computational Brain Surgery: Towards the augmented clinical neurosciences of the future*. **Di Ieva A.** 20 October 2020
- Webinar - Brain and Spine Surgery: What a GP needs to know, Part I. **Stoodley M:** [Cranial Nerve Hyperfunction Syndromes](#), **Di Ieva A:** [Brain And Skull Base Tumours: Two exemplary studies in light of modern and future trend in function neuro-oncology](#), 1 December 2020
- Webinar - Brain and Spine Surgery: What a GP needs to know, Part II. **Stoodley M:** [CSF disorders: Too much, too little, or in the wrong place!](#), and **Seex K:** [Lumbar spinal stenosis](#), 3 December 2020

RESEARCH GRANTS & AWARDS

- **NHMRC Ideas Grant:** Preventing stroke from arteriovenous malformations using precision thrombosis. **Stoodley M, McRobb L (\$993,866)**
- **Macquarie University Research Fellowship Grant:** A magnetic multitool in our hands: Strong pulsed magnetic fields for brain repair. **Packer N, Di Ieva A, Guller A (\$49,932)**
- **Macquarie University Research Infrastructure Grant (MQRIS-S) Scheme:** An artificial intelligence platform for identifying how the brain perceives complex images. **Di Ieva A, Chung R (\$103,309)**

New students/researchers

Dr **Abdulla Al Suman** (Research Associate at the CNS Lab)

Robert Newport and **Poonam Kumari** (PhD candidates at the CNS Lab).