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:


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
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• 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


• 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


• Jang K, Rosenfeld JV, **Di Ieva A**. *Paulus of Aegina and the Historical Origins of Spine Surgery*. *World Neurosurg* 133:291-301. 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
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


Contributions, interviews and non-peer reviewed publications

- 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 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=IwAR0hgeZBNr7tcZq2bJrdMuFCZNuYqd2W6g6-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

**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.
• HealthShare webinar for GPs: *Brain and Skull Base Tumours, Cerebrospinal fluid disturbances.* Di Ieva A, Stoodley M. 6 August 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 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).