

Zapraszamy na kurs zamawiany (11-14.04.2011):

Brain physics (not only for engineers) - in 10 lectures

WYKŁADOWCA: Prof. dr hab. inż. Marek Czosnyka

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Terminy wykładów:

- 11 IV 2011 (pn) od godz. 18.00 do 20.35, sala 204/A1 (2 x przerwa 10 min)
- 12.IV.2011 (wt) od godz. 18.00 do 20.35, sala 204/A1 (2 x przerwa 10 min)
- 13.IV.2011 (śr) od godz. 19.00 do 20.40, sala 204/A1 (1 x przerwa 10 min)
- 14.IV.2011 (czw) od godz. 18.00 do 19.40 sala 4.04 C-13 (1 x przerwa 10 min)

Tematy wykładów:

1. Physics of cerebrospinal fluid (CSF) circulation in brain: Sites and mechanisms of CSF secretion, circulation and reabsorption. Physiological and modelling description.
Cerebral blood flow and metabolism: physiology of brain blood inflow, circulation and venous outflow. Architecture of cerebrovascular tree.
2. Regulation of cerebral blood flow. Mechanisms: myonic, metabolic and chemical. Structure of arterial walls, role of endothelium. Macroscopic observations: Lassen's curve. Dynamic and static autoregulation.
3. Intracranial pressure: measurement and monitoring: CSF pressure as a 'golden standard'. Intraparenchymal pressure. Sensors, drifts, errors and monitoring techniques. Other modalities: transcranial Doppler, laser Doppler flowmetry, thermal dilution, Near Infrared Spectroscopy.
4. Intracranial pressure (ICP) - physiology and pathophysiology: ICP is more than the number. Waves and fluctuations of ICP, interpretation. Spectral components of ICP. Cerebral perfusion pressure: Definitions, source of instability. Implication on management protocols. What happens when CPP is too low, and when it is too high? Waveform analysis of intracranial pressure. Pulse analysis: volume-pressure compensatory reserve, high frequency centroids, morphological methods.

5. Pressure reactivity: relationship between ICP and arterial blood pressure (ABP). Pressure-reactivity index, computational methods. Phase shift between ABP and ICP. Optimization of cerebral perfusion pressure: Relationship between Pressure Reactivity and CPP. Does 'optimal CPP' exist always? Implications on management. Traumatic brain injury. Links between ICP, CPP, PRx monitoring and outcome after TBI. Does CT picture really help? Neuropsychological assessment versus CPP
6. Pressure-volume compensatory reserve: Pressure-Volume Index, RAP index. Applications in hydrocephalus. Modelling of CSF compensation: Mathematical model (Marmarou). Modelling of cerebral blood flow: integration of cerebral blood flow into Marmarou's model. Volume-pressure infusion tests: Who needs a shunt? Typical patterns of infusion studies in different forms of CSF circulatory disorders. Resistance to CSF outflow: What it is and what it isn't? Use of the resistance to optimize management of hydrocephalus.
7. CSF shunts for treatment of hydrocephalus – construction and engineering of CSF hydrocephalus shunts: from historical to contemporary designs. Shunt testing in-vivo: Use of infusion tests to assess shunt functioning after implantation: patterns of underdrainage and overdrainage. Slit ventricles syndrome. Overnight ICP monitoring
8. Transcranial Doppler Ultrasonography: vasospasm and testing of cerebral autoregulation. Compartmental compliances of brain: assessment of cerebral arterial compliance and lumped compliance of CSF and venous pool. Monitoring of Monro-Kelly doctrine: Mutual relationship between brain compartmental compliance as a marker when intracranial hypertension becomes 'refractory'
9. Time constant of cerebrovascular system: applications in Common Carotid Artery Stenotic Disease and cerebral vasospasm following Subarachnoid Haemorrhage. Pulsatility of cerebral blood flow: Transcranial Doppler Pulsatility index and other useful measures of blood transport in great cerebral vessels. Is Pulsatility index related to ICP?
10. Cerebrovascular impedance: linear modelling of basal cerebral vessels. Is pulsation of blood transport greater than pulsation of arterial blood pressure? Critical closing pressure (CCP) - theoretical concept versus clinical implications. Use of CCP to measure 'real CPP' or non-invasive estimate of ICP. Non-invasive methods for ICP monitoring: tympanometry, transcranial Doppler flowmetry, other ultrasound methods.

REFERENCES (will be provided as PDFs)

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