The Anesthetic Biobank of Cerebrospinal fluid; storing CSF for future neuroscientific research

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Background and goal

- More knowledge of the neurobiology of the cerebrospinal fluid (CSF) is needed for a better understanding of the pathophysiology of degenerative brain diseases and for biomarker development
- There is a need for CSF samples from healthier patients from a wider age span
- In collaboration with colleagues from our neurology and clinical chemistry departments, we have set up the Anesthetic Biobank of Cerebrospinal fluid (ABC) to facilitate the banking of CSF from patients without clinical suspicions of cognitive or neurological problems, who are undergoing planned spinal anesthesia

Materials and methods

- All patients > 18 years scheduled for elective (inpatient or outpatient) surgery under spinal anesthesia are invited to participate
- After puncture of the sub-arachnoid space and prior to administering spinal anesthesia, 10 ml of CSF is aspirated with five 2 ml syringes (this takes approximately 3 minutes). The maximum block height and any subsequent episodes of PDPH are recorded
- The CSF and blood is immediately transferred on melting ice and sent to the laboratory. The first 2 ml of CSF and 10 ml of blood is used for cell count, glucose, albumin and protein analysis. The remaining 8 ml CSF and 10 ml blood is centrifuged and stored at -70° C in 0.4 ml aliquots
- Data regarding patient characteristics, medical history, surgery, spinal anesthesia and the postoperative period (length of stay, complications, clinical delirium scores) are stored in a database

Figure 1. Flowchart of inclusion procedure / data handling.

Current status & future developments

- After 4 months of inclusion 100 patients have participated
- The Biobank is expected to contain 200 CSF and blood samples across all age groups before 2018
- One episode of PDPH occurred (27 years, female). After discharge home the patient showed features of a low CSF pressure headache. Her symptoms settled spontaneously over a few days without any interventions
- Five patients had a vaso-vagal reaction during CSF aspiration. In 2 cases the aspiration attempt was stopped prematurely. In the other 3 cases a full 10ml was obtained. In all 5 cases, the symptoms improved with administration of 10 mg ephedrine and/or 0,5 mg atropine

Table 1. Population characteristics (N=100)

Mean age (range)	51 (18-84) year	
Numbers per age decade	10s: 4 20s: 17 30s: 7 40s: 13 50s: 23 60s:19 70s: 14 80s: 3	
Female / Male	40/60	
ASA Classification	I: 54 II: 34 III: 12	
Inpatient / outpatient	50/50	
CSF Aspiration		
Mean aspiration time (range)	2,6 (1-10) minutes	
Mean aspiration volume (range)	9,1 (0-13) ml	
Post dural puncture headache frequency	1/100	
Vaso-vagal response frequency	5/100	
Routine analysis (data shown as mean)		
	CSF	Plasma
Leucocytes	1,58 ·10 ⁶ L ⁻¹	7,0 ·10 ⁹ L ⁻¹
Erythrocytes	220 ·10 ⁶ L ⁻¹	X
Albumin	0,27 g·L ⁻¹	44 g·L ⁻¹
Total protein	0,42 g·L ⁻¹	72 g·L ⁻¹
Glucose	3,5 mmol·L ⁻¹	5,6 mmol·L ⁻¹
Spinal anesthesia		
Anesthetics used	Prilocaine hyperbaric 2% Bupivacaine iso- & hyperbaric 0.5%	
Mean volume adm. (range)	2,9 (1,6-4) ml	

Figure 2. sensory block height of patients with >2ml CSF aspiration (N=94) compared to a reference group without aspiration (N=59). Shown in percentages.

- Internally, collaborations with the clinical laboratory have been established for fundamental research on biogenic amines and neural steroids
- However, we are willing to collaborate with interested colleagues, both nationally and internationally, in the future