Neurocardiology: close interaction between heart and brain

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The interaction between heart and brain becomes increasingly important as the underlying mutual mechanisms become better understood. The speciality that deals with the brain-heart connection has become known as neurocardiology [1]. Neurocardiology refers to (patho)physiological interplays of the nervous and cardiovascular systems [2]. Baroreflex sensitivity and heart rate variability are important parameters in understanding the influence of the autonomic nervous system on both heart and brain activity [3, 4]. Over the past years, there is increasing evidence about the brain-heart interaction with major potential implications for treatment of cardiovascular diseases. For instance, cerebrovascular accidents (CVAs) and transient ischaemic attacks (TIAs) are frequently caused by cardiac arrhythmias and/or congestive heart failure [5, 6]. In particular atrial fibrillation may result in cognitive disorders preceding the occurrence of TIAs or CVAs [7–10]. Even in the absence of manifest stroke, atrial fibrillation is a risk factor for cognitive impairment and hippocampal atrophy. Therefore, cognition and measures of structural brain integrity should be considered in the evaluation of novel treatments for atrial fibrillation.

On the other hand, cerebrovascular dysfunction may lead to electrocardiographic disorders and cardiac rhythm disturbances. Subarachnoid bleeding may lead to dramatic electrocardiographic changes and even ventricular fibrillation, possibly due to QT-interval prolongation [11, 12]. Panic disorders and emotional distress such as the Takotsubo syndrome may give rise to (supra)ventricular tachycardias with ensuing transient left ventricular dysfunction [13–16]. Coronary artery bypass surgery (CABG) has major effects

on neurocognitive functioning [17]. However, the literature still remains undecided on the role of intra-operative emboli and cognitive decline after surgery [18]. More attention should be focussed on the composition, size and location instead of the absolute number of intra-operative emboli. Growing awareness of neurocognitive decline in chronic vascular and congenital heart disease patients must challenge both clinicians and investigators [19]. Exercise stimuli may prevent or slow down the cognitive decline in elderly patients with heart failure. In particular, the therapeutic implications in the direct interrelation between the nervous system, the brain and the heart will increasingly become a dominant focus of forthcoming studies [20].

The future of therapeutic approaches in neurocardiology lies both in novel treatment as in applying scientific integrative medical ideas that take into account concurrent chronic degenerative and vascular disorders and interactions of multiple drug and non-drug treatments. In this respect, vagal stimulation, exercise training, electrical neurostimulation, music therapy, and –recently– renal denervation have become interesting options in the treatment of angina pectoris, heart failure, and hypertension [21–26]. Various patient groups (psychological distress, atrial fibrillation, heart failure, post-CABG) may benefit when the appropriate mechanisms of the interrelation between the nervous system, brain and heart become elucidated [27]. When these relationships are better understood, more appropriate therapeutic measures can be taken to benefit patients with cardiovascular and cerebrovascular diseases [28].

In the beginning of 2011, the ICIN-Netherlands Heart Institute requested the Royal Academy of Sciences (KNAW) to set up an Academy Colloquium. Academy colloquia are initiatives of the KNAW consisting of symposia dedicated to an interesting scientific topic for a limited audience of 50 national and international individuals (15 speakers, 35 attendees). Fortunately, our request was granted to organise an academy colloquium entitled ‘*Neurocardiology: direct interaction between brain, heart, and nervous system*’. The meeting was held on Thursday 31 May and Friday 1 June 2012, and

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turned out to be very successful in terms of excellent speakers and a very lively and experienced audience.

This special February 2013 issue is exclusively dedicated to the topic of our academy colloquium. To that purpose, most presenters have delivered nice and readable articles based on the presentations they gave during the colloquium. We gratefully thank all authors for their efforts and we hope that the readers of NHJ will enjoy reading the state-of-the-art achievements in neurocardiology [29].

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