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How to cite

HALLER, Sven. Use of MR Imaging-defined Connectome to Predict the Recovery of Patients after Cardiac Arrest. In: Radiology, 2018, vol. 287, n° 1, p. 256–257. doi: 10.1148/radiol.2017172372

This publication URL: https://archive-ouverte.unige.ch/unige:145430
Publication DOI: 10.1148/radiol.2017172372

Radiology

Use of MR Imaging–defined Connectome to Predict the Recovery of Patients after Cardiac Arrest[1]

Sven Haller, MD, MSc

Cardiac arrest is a leading cause of death. The majority of patients (≤80%) resuscitated from cardiac arrest do not regain consciousness immediately; they remain in a coma for hours to weeks or even in a long-term vegetative state (1). The outcome of patients with acute coma after cardiac arrest ranges from full recovery to persistent vegetative state. Therefore, in the initial stage of coma after cardiac arrest, a prediction of the outcome is of paramount importance both for the relatives and treating medical team. However, the currently available validated tools to predict outcome remain limited. It is difficult to perform ethical research and obtain consent for these severely ill patients. This explains why limited research is available, mostly single-center studies, despite the clinical need to predict outcome for comatose patients after cardiac arrest.

The available tools to assess the comatose patient include electroencephalography and evoked potentials (2,3). Concerning magnetic resonance (MR) imaging, T2-weighted fluid attenuation inversion recovery and, in particular, diffusion-weighted imaging (4,5) may provide prognostic information.

Advanced MR imaging techniques, notably resting-state functional MR imaging, remain poorly investigated in the setting of acute coma after cardiac arrest. This is because it is challenging to perform functional MR imaging in such a severely ill patient group. Moreover, it is difficult to perform multisite functional MR imaging studies even in less severely ill patients. The research team to actually accomplish both tasks at the same time can be congratulated because they addressed a relevant clinical question.

In the article by Sair et al (6), the authors had success assessing resting-state networks in this severely ill patient group who underwent acute coma after cardiac arrest across three different sites and by using three different MR machines. Two of the well-established resting-state networks, notably the default-mode network and the salience network, predicted good versus bad outcome. These two functional connectivity functional MR imaging measures were further compared with the established T2-weighted fluid attenuation inversion recovery and diffusion-weighted imaging parameters. The combination of default-mode network and the salience network with functional MR imaging outperformed the established T2-weighted fluid attenuation inversion recovery sequence (area under the curve, 0.88 vs 0.74, respectively) or diffusion-weighted imaging (area under the curve, 0.71). Importantly, the assessment of resting functional MR imaging functional connectivity was successful across different sites with different MR imagers, which indicated that there was potential clinical use for the resting functional MR imaging–derived measure to predict outcome in the acute phase of coma after cardiac arrest. Future large-scale studies will be necessary to validate the results from Sair et al. It will be of particular interest to address the question of whether the combined assessment of MR parameters (eg, resting functional MR imaging, T2-weighted fluid attenuation inversion recovery, and diffusion-weighted imaging) and electroencephalography result in further improvements to predict outcome of patients with acute coma after cardiac arrest.

Disclosures of Conflicts of Interest: M.H. disclosed no relevant relationships.

https://doi.org/10.1148/radiol.2017172372

Content code: NR

Radiology 2018; 287:256–257

[1] From the Affidea Centre Diagnostique Radiologique de Carouge (CDRC), Clos de la Fonderie 1, 1277 Carouge, Switzerland; Department of Surgical Sciences, {Division of} Radiology, Uppsala University, Uppsala, Sweden; and Department of Radiology, University of Geneva, Geneva, Switzerland. Received October 11, 2017; final version accepted October 12. **Address correspondence to** the author (e-mail: *Sven.haller@me.com*).

Conflicts of interest are listed at the end of this article.

See also the article by Sair et al in this issue.

References

1. Marion DW. Coma due to cardiac arrest: prognosis and contemporary treatment. F1000 Med Rep 2009;1:89.
2. Hofmeijer J, Beernink TM, Bosch FH, Beishuizen A, Tjepkema-Cloostermans MC, van Putten MJ. Early EEG contributes to

multimodal outcome prediction of postanoxic coma. Neurology 2015;85(2):137–143.

3. Rossetti AO, Oddo M, Logroscino G, Kaplan PW. Prognostication after cardiac arrest and hypothermia: a prospective study. Ann Neurol 2010;67(3):301–307.
4. Hirsch KG, Mlynash M, Jansen S, et al. Prognostic value of a qualitative brain MRI scoring system after cardiac arrest. J Neuroimaging 2015;25(3):430–437.
5. Wijman CA, Mlynash M, Caulfield AF, et al. Prognostic value of brain diffusion-weighted imaging after cardiac arrest. Ann Neurol 2009;65(4):394–402.
6. Sair HI, Hannawi Y, Li S, et al. Early functional connectome integrity and 1-year recovery in comatose survivors of cardiac arrest. Radiology 2018;287(1):247–255.