20 regions presélectionné correspondant à des faisceaux de matière blanche. Un modèle pronostique intégrant une DTI avec les variables cliniques et radiographiques du score International Mission for Prognosis and Analysis of Clinical Trials (IMPACT) score a été construit. Les patients ont été évalués à un an avec une échelle modifiée de Glasgow (GOS).

Résultats.— Parmi les 102 patients étudiés, le GOS à un an était défavorable dans 39 cas et favorable dans 63 cas. Le DTI a révélé des lésions multifocales de la substance blanche, dont la sévérité a été associé au pronostic. Pour la prédiction du pronostic défavorables, l’aire sous la courbe (ROC) était de 0,89 pour le score DTI-IMPACT et de 0,64 pour le score IMPACT seul (p < 0,001). Le score DTI-IMPACT a une sensibilité de 74 % et une spécificité de 95 % pour la prédiction d’un pronostic défavorable.

Conclusions.— Les lésions multifocales de la substance blanche sont très répandues chez les patients atteints de troubles de la conscience après un traumatisme crânien. L’évaluation quantitative de la substance blanche avec le DTI augmente la précision de la prédiction des résultats à long terme du traumatisme crânien par rapport au score pronostique existant.

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English version

CO13-001-e

Which consciousness in coma?
A. Vanhaudenhuyse
Coma Science Group, CR Cyclotron, université de Liège, CHU de Liège,
Sart Tilman, 4000 Liège, Belgium
E-mail address: avanhaudenhuyse@ulg.ac.be.

Several states indicate a loss of consciousness: coma, anesthesia, sleep. The study of the "vegetative" state, recently renamed as unresponsive wakefulness syndrome, an awakening state without signs of consciousness, emphasizes how the knowledge of consciousness is uncertain, as well as how there is an urgent need to explore it.

The goal of our team is to increase the knowledge of residual brain function in patients who survive a traumatic or severe hypoxic-ischemic brain damage but remain in a coma, “vegetative” state, minimally conscious state or locked-in syndrome. Indeed, these patients still cause diagnosis, prognosis and therapeutic challenges. Moreover, the study of such patients is also likely to improve our understanding of human consciousness. The increasing use of functional neuroimaging (positron emission tomography, high-density electroencephalography and structural and functional magnetic resonance imaging) allows us to better understand the brain lesions of disorders of consciousness patients and better assess the residual functioning of these patients.

Further reading

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CO13-002-e

Neural signatures of neurological recovering from coma
S. Silva
Interim U825, service de réanimation polyvalente, CHU Purpan,
Wolfson Brain Imaging Center, 1, place Baylac, 31059 Toulouse, France
E-mail address: stein.silva.s@gmail.com.

Keywords: Consciousness; Wakefulness; Coma; Default-mode network; Event related potential; Brain plasticity

The loss of consciousness during coma arises due to a range of very different etiologies. Patients progress through different paths of recovery, depending on the extent of plastic brain processes. Hence, when assessing a patient at a particular point in time post-ictus it is difficult to make accurate judgments about the nature of their cognitive processes based simply on behavior. A high rate of misdiagnosis has been prevalent, leading to troubling ethical issues for clinical medicine.

The study of the functional and structural brain changes during the transition from coma to awareness, aims to identify a set of specific patterns of brain activity related to neurological recovery and then give to clinician new and useful diagnosis/prognosis assessment tools. Otherwise, from a fundamental point of view, only this dynamic approach might allow the characterization of the brain structures “essential” to build consciousness.

In the present review, we have attempted to bring together a broad range of findings in the scientific literature that sheds light on the dynamic interplay between wakefulness and awareness on brain-injured patients. We first outline our working hypothesis and main results issued from functional neuroimaging (i.e. default-mode network). We then examine the electrophysiological experimental studies that have attempted the physiological signature of this transition (i.e. resting state, neural processing of auditory regularities). In a final section, we examine the relevance of these findings in a patient level and propose potential future direction for clinical research.

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Quantitative MRI in brain injured patients
L. Puybasset
Service de neuro-réanimation chirurgicale Babinski, département d’anesthésie-réanimation, université Pierre-et-Marie-Curie, groupe hospitalier Pitie-Salpêtrière, 47-83, boulevard de l’Hôpital, Paris 6, 75013 Paris, France
E-mail address: louis.puybasset@psl.aphp.fr.

Keywords: Brain injury; Prognosis; Imagery; DTI

Background.— Existing methods to predict recovery following severe traumatic brain injury (TBI) lack accuracy. This study determines the value of quantitative diffusion tensor imaging (DTI) to predict functional outcome 1 year after severe TBI.

Methods.— In a multicenter study, we prospectively enrolled 102 patients who remained comatose at least 7 days after TBI. Patients underwent brain MRI, which included DTI analyzed in 20 pre-selected white matter tracts. A prognostic model integrating DTI with clinical and radiographic variables from the International Mission for Prognosis and Analysis of Clinical Trials (IMPACT) score was constructed. Patients were evaluated at 1 year with a modified Glasgow Outcome Scale (GOS).

Results.— Of the 102 patients studied, GOS at 1 year was unfavorable in 39 and favorable in 63. DTI revealed multifocal white matter damage, the severity of which was associated with outcome. For the prediction of unfavorable GOS, the area under the receiver operating characteristic (ROC) curve was 0.89 for the DTI-IMPACT score as compared to 0.64 for the IMPACT score alone (P < 0.001). The DTI IMPACT score has a sensitivity of 74% and a specificity of 95% for the prediction of unfavorable outcome.

Conclusions.— Multifocal white matter damage is prevalent in patients with impaired consciousness after TBI. White matter assessment with quantitative DTI increases the accuracy of long-term outcome prediction when compared with the best available clinical/radiographic prognostic score.

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