Etats de conscience altérée: mieux comprendre pour mieux traiter.

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A new name for « vegetative »

Unresponsive wakefulness syndrome: a new name for the vegetative state or apallic syndrome

He'll always be a vegetable.

Laureys et al, *BMC Medicine* 2011
Areas systematically dysfunctional in “vegetative” state

Laureys et al, *Neuroimage* 1999
Consciousness ≈ thalamo-cortical

Intralaminar nuclei “reconnections” in spontaneous recovery from “vegetative” unresponsive state

Intralaminar nuclei stimulation induces “recovery” from minimally responsive state

Laureys et al, Lancet 2000

Schiff et al, Nature 2007
Consciousness ≈ connectivity

EEG-TMS

Rosanova and Gosseries et al, in press
Two awareness networks

EXTERNAL or SENSORY AWARENESS

INTERNAL or SELF AWARENESS

Laureys, *Scientific American* 2007
“Resting” default mode connectivity

Vanhaudenhuyse et al, *Brain* 2010
Diagnostic error

n=103 post-comatose patients
- 45 clinical consensus diagnosis ‘vegetative state’
- 18 signs of awareness (Coma Recovery Scale)

40% potential misdiagnosis

Schnakers et al, *BMC Neurology* 2009
Yes-No communication with fMRI

HEALTHY SUBJECT

Answers « YES »

Answers « NO »

« VEGETATIVE STATE »

Monti & Vanhaudenhuyse, Coleman, Boly, Pickard, Tshibanda, Owen, Laureys
New England J Med 2010
EEG-based Brain Computer Interfaces

“MOVE YOUR FOOT”
HEATHY
CONTROL
SUBJECT

“MOVE YOUR HAND”

“VEGETATIVE”
UNRESPONSIVE
PATIENT

3/16 VS/UWS (19%)
- 2/5 traumatic (40%)
- 1/11 non-traumatic (9%)

7/23 MCS (30%)
- 7/15 traumatic (49%)
- 0/8 non-traumatic (0%)

Aphasia as a confound

The problem of aphasia in the assessment of consciousness in brain-damaged patients

Steve Majerus\textsuperscript{1,3}, Marie-Aurélie Bruno\textsuperscript{2,3}, Caroline Schnakers\textsuperscript{2}, Joseph T. Giacino\textsuperscript{4} and Steven Laureys\textsuperscript{2,3,*}

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Bruno et al, J Neurology, in press
Predicting outcome in chronic DOC

**ACTIVATION TO THE OWN NAME**

**ATYPICAL 'HIGH LEVEL' CORTICAL ACTIVATION**


Perrin et al, *Arch Neurol* 2006

Understanding plasticity

Homeostatic decline SWA ≈ plasticity (Tononi)

Landnes and Bruno et al, *Brain*, 2011
“Dreaming” in MCS?

Landnes and Bruno et al, *Brain*, 2011
Multimodal imaging

Bruno *et al*, *Prog Brain Res*, 2011
Tshibanda *et al*, *Neuroradiology*, 2010
Nociception and pain

Do you think that patients in a vegetative state can feel pain?

<table>
<thead>
<tr>
<th></th>
<th>Medical doctors (n=1166)</th>
<th>Paramedical professionals (n=538)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Yes</td>
<td>56</td>
<td>68</td>
</tr>
<tr>
<td>No</td>
<td>44</td>
<td>32</td>
</tr>
</tbody>
</table>

*p < 0.001

Nociception Coma Scale

**Total score > 7 / 12 = analgesic treatment**


**Consciousness | Neural correlates | Diagnosis | Prognosis | Treatment | Ethics | Conclusion**
Do they feel pain?

Noxious electrical stimulation

Pain in minimally conscious state


http://neurology.thelancet.com
Conclusion

Neural correlates of conscious awareness
≈ emergent property of widespread fronto-parietal connectivity

Diagnostic use
≈ 40% misdiagnosis

Prognostic use
multimodal MRI

Therapeutic use
pain treatment / deep brain stimulation thalamus

Ethical issues

Consciousness | Neural correlates | Diagnosis | Prognosis | Treatment | Ethics | Conclusion

Laureys & Boly, Nature Clinical Practice, 2008
Owen, Schiff & Laureys, Prog Brain Res, 2009
Slides on website
MSc & PhD positions open