COST-EFFECTIVENESS EVALUATION OF THE INTRA-DUODENAL CONTINUOUS LEVODOPA INFUSION IN ADVANCED AND SEVERE PARKINSON’S DISEASE

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Background

- Parkinson’s disease (PD) is a chronic condition associated with degeneration of neurons in the brain.
- It is characterized by motor and non-motor symptoms, often difficult to control.
- The quality of life of patients is affected by these symptoms, often resulting in disabilities that interfere with daily activities and social life.
- The spiral of cost of the condition is often added to the spiral of motor, psychic and cognitive degradations caused by the disease.
- Associated with the aging of the population, it’s becoming a public health issue.
The implementation of a drug treatment is a progressive process that requires multiple adjustments, both in the choice of the most suitable drug and in the identification of the optimal dose.

The aims of the various treatments are
  • to **reduce and relieve the symptoms**, without stopping the progression of the disease.
  • to restore a normal concentration of dopamine in the brain

**Levodopa Continuous Infusion of Gel** (LCIG) is a new alternative to control motor complications by allowing the programming and the adaptation of doses as needed.
Objective of the study

To estimate the cost-effectiveness of a new treatment in Parkinson disease
METHODS
CECILE Study

- Prospective, double-blind, randomized and multicenter study
- Routine follow-up over 1 year (4 visits) in 21 centers in France between 2010 and 2016
- Two randomization arms:
  - Optimized Conventional Oral Therapy (OCOT)
  - Levodopa Continuous Infusion of Gel (LCIG)
- Primary endpoint: PDQ-39 quality of life score at 6 months
- Secondary end points: EQ-5D-3L + 9 clinical scales
- e-CRF for patients and caregivers filled during each visit
- 43 patients included in the FAS analysis population
  - 23 patients in the OCOT arm
  - 20 patients in the LCIG arm
Utility data:

- EQ-5D-3L: a standardized health status instrument providing an interval scale for measuring the intervention incremental effect on health of the LCIG treatment.

- Each of the 5 dimensions is divided into 3 levels of perceived problems:
  - Level 1: no problem
  - Level 2: some problems
  - Level 3: extreme problems

- Health states may be converted into a single summary index by applying a formula that essentially attaches weight to each of the levels in each dimension such as to obtain French tariffs for the overall score (Julie Chevalier in France).
**Data Input (2/2)**

**Effectiveness**: survival analysis before death or adverse event attributable to the treatment

**Cost data**: « Collective » perspective

- **Outpatient resources consumption**: RUD questionnaire with direct medical care and direct non-medical care
  - Medical consultations
  - Paramedical acts
  - Biological acts
  - Radiological acts
  - Drugs
  - Transportation between home and hospital
  - Family caregivers time

- **Hospital resources consumption**: based on a PMSI study
Statistical & Economic analysis

**Statistical**
- **Incomplete data**: Multiple imputation
- **Survival analysis**: Kaplan Meier
- **QALYs**: Manca method
- **Treatment of uncertainty**: Sensitivity analysis by resampling (non parametric bootstrap method)

**Economic**
- **ICER**: \[ \frac{C_2 - C_1}{E_2 - E_1} \]
- **Net Monetary Benefit**: \[ NMB = WTP \cdot E - C \]
RESULTS
## Base Case at 6 months

<table>
<thead>
<tr>
<th>Resource</th>
<th>Treatment</th>
<th>Mean (€)</th>
<th>Std Dev</th>
<th>p-value</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Costs</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Transportation</td>
<td>LCIG</td>
<td>1 252,01</td>
<td>1 118,48</td>
<td>0,160</td>
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<tr>
<td></td>
<td>OCOT</td>
<td>794,90</td>
<td>956,80</td>
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<tr>
<td><strong>Medical</strong></td>
<td>LCIG</td>
<td>104,21</td>
<td>91,71</td>
<td>0,317</td>
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<tr>
<td></td>
<td>OCOT</td>
<td>166,50</td>
<td>214,70</td>
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<tr>
<td><strong>Paramedical</strong></td>
<td>LCIG</td>
<td>2 017,53</td>
<td>1 821,37</td>
<td>0,691</td>
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<tr>
<td></td>
<td>OCOT</td>
<td>2 230,20</td>
<td>2 794,30</td>
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<tr>
<td><strong>Caregivers time</strong></td>
<td>LCIG</td>
<td>2 153,89</td>
<td>2 354,74</td>
<td>0,705</td>
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<tr>
<td></td>
<td>OCOT</td>
<td>6 258,40</td>
<td>22 518,36</td>
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<tr>
<td><strong>Drug</strong></td>
<td>LCIG</td>
<td>2 985,61</td>
<td>3 038,59</td>
<td>0,004</td>
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<tr>
<td></td>
<td>OCOT</td>
<td>8 165,10</td>
<td>6 997,95</td>
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<tr>
<td><strong>Hospitalisation</strong></td>
<td>LCIG</td>
<td>5 928,11</td>
<td>9 622,04</td>
<td>0,188</td>
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<tr>
<td></td>
<td>OCOT</td>
<td>2 728,50</td>
<td>2 780,87</td>
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<tr>
<td><strong>Total cost</strong></td>
<td>LCIG</td>
<td>13 189,35</td>
<td>9 618,32</td>
<td>0,342</td>
</tr>
<tr>
<td></td>
<td>OCOT</td>
<td>19 548,70</td>
<td>25 483,96</td>
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</tbody>
</table>

### EQ-5D-3L

<table>
<thead>
<tr>
<th>Visite</th>
<th>Treatment</th>
<th>Mean</th>
<th>Std Dev</th>
<th>p-value</th>
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<td><strong>EQ-5D-3L</strong></td>
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</tr>
<tr>
<td>D0</td>
<td>LCIG</td>
<td>0,3</td>
<td>0,34</td>
<td>0,39</td>
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<tr>
<td></td>
<td>OCOT</td>
<td>0,22</td>
<td>0,26</td>
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</tr>
<tr>
<td>D0 + 6</td>
<td>LCIG</td>
<td>0,42</td>
<td>0,3</td>
<td>0,03</td>
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<tr>
<td></td>
<td>OCOT</td>
<td>0,22</td>
<td>0,26</td>
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</table>
ICER & Efficiency Frontier

<table>
<thead>
<tr>
<th>Interval</th>
<th>Treatment</th>
<th>Cost</th>
<th>ΔCost</th>
<th>p-value</th>
<th>QALY</th>
<th>ΔQALY</th>
<th>p-value</th>
<th>ICER</th>
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</thead>
<tbody>
<tr>
<td>D0 ~ D0 + 6</td>
<td>LCIG</td>
<td>13 189,35</td>
<td>-6 359,35</td>
<td>0,342</td>
<td>0,207</td>
<td>0,103</td>
<td>0,02</td>
<td>&lt;0</td>
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<tr>
<td></td>
<td>OCOT</td>
<td>19 548,70</td>
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</tr>
</tbody>
</table>
Acceptability curve

Willingness to pay (€/QALY)

Probability of being cost-effective

- LCIG
- OCOT
Net Monetary Benefit

Willingness to pay (€/QALY)

LCIG  OCOT

64 000 €
Discussion

- LCIG achieves a reduction of motor fluctuations improving patients’ QoL.
- LCIG is a cost-effective therapy and could be seen as an alternative treatment to OCOT for the patients with advanced PD.
- Exploitation of the follow-up at 12 months while taking into account the treatment switching at 6 months in order to have results in the long term.
- ICER’s challenge is to compare with a value of WTP. NMB is a simpler method for dealing with uncertainty and an unambiguous criterion for choosing between strategies.


THANK YOU FOR YOUR ATTENTION

Questions?
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