TROUBLESHOOTING ALGORITHMS FOR COMMON DBS RELATED PROBLEMS IN PARKINSON’S DISEASE

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OUTLINE

• Motor issues:
  – Dysarthria
  – Freezing of gait
  – Balance problems

• Behavioral issues:
  – Impulsivity, mania
  – Apathy
  – Depression
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DYSARTHRIA

• A complex & frequent problem in PD with STN DBS (variable frequency 9.3%)  

• Several factors:  
  – dopaminergic medication  
  – surgical procedure  
  – stimulation & diffusion  
  – disease progression

Castrioto et al. 2013, Tripoliti et al. 2011, Moreau et al. 2011
DYSARTHRIA

OFF med, OFF stim

R 3.3 V/185 Hz/60 µs
L 3.6 V/170 Hz/60 µs

R 3.3 V/185 Hz/90 µs
L 3.6 V/170 Hz/90 µs

Long-term effect

Pinto 2005
Effects of subthalamic stimulation on speech of consecutive patients with Parkinson disease

E. Tripoliti, MPhil
L. Zrinzo, MD, MSc
I. Martinez-Torres, MD
E. Frost, MSc
S. Pinto, PhD
T. Foltynie, MRCP, PhD
E. Holl, MD
E. Petersen, MD
M. Roughton, MSc
M.I. Hariz, MD, PhD
P. Limousin, MD, PhD

Neurology® 2011;76:80–86
POSTOPERATIVE DYSARTHRIA

TEST OFF - ON UNILATERAL STIMULATION

IMPROVEMENT

↑ STIM A

NO EFFECT

LEVODOPA RESPONSIVE?

↑ DA TX

NO EFFECT OR WORSENING

REPROGRAMMING:
• try another contact
• ↓ stim A or Fr
• Bipolar stim
• Interleaving stim

NO EFFECT

LEAD REPOSITIONING

Long-term effect
FREEZING OF GAIT

Key-points:

• Levodopa responsiveness
• Effect of stimulation
FREEZING OF GAIT

Fleury et al. Mov Disord 2016
POSTOPERATIVE FOG

L-DOPA RESPONSIVE?
- No: Physiotherapy
- Yes: ↑ DA tx

STIMULATION
- Improvement:
  - ↑ STIM
- No-effect or worsening:
  - Reprogramming more ventral contact, ↓A, ↓Fr, bipolar stim

repositioning
- No-effect
BALANCE PROBLEMS

- Timing (acutely after programming) ?
- Levodopa responsive ?
BALANCE PROBLEMS

Acute after programming

Dyskinesias?

↓ STIM or DA tx

Hypotonia & cerebellar syndrome

Reprogramming:
Try a more dorsal contact
↓ STIM

Progressive worsening

Levodopa responsive?

Adjust DA tx
Physiotherapy
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BEHAVIORAL EFFECTS

• ACUTE
  – Lesion-like effect
  – Synergistic effect of medication & stimulation

• CHRONIC
  – Chronic medication changes
  – Plastic changes induced by stimulation
ACUTE EFFECTS OF STIMULATION MIMICS
PSYCHOSTIMULANT EFFECTS OF LEVODOPA

ARCI euphoria subscale:
Amphetamine-like motivational effects
↑ well being, ↓ fatigue and anxiety

Funkiewiz et al. 2003
ACUTE BEHAVIORAL EFFECTS

- Transient euphoria
- Hypomania, mania
- Aggressive behavior
- Impulsivity
- Pathological crying, laughing

Castrioto et al. Lancet Neurol 2014
Mallet et al. PNAS 2007
ACUTE BEHAVIORAL CHANGES

↓ DA medication (Dopamine Agonists as first)

If time-locked to stimulation:
• ↓ stimulation
• Try a more dorsal contact

Not effective

CLOZAPINE
Non-motor dopamine withdrawal syndrome after surgery for Parkinson's disease: predictors and underlying mesolimbic denervation

Stéphane Thobois, Claire Ardouin, Eugénie Lhommée, Hélène Klinger, Christelle Lagrange, Jing Xie, Valérie Fraix, Maria Clara Coelho Braga, Rachid Hassani, Andrea Kistner, Alexandra Juphard, Eric Seigneuret, Stephan Chabardes, Patrick Mertens, Gustavo Polo, Anthonin Reilhac, Nicolas Costes, Didier LeBars, Marc Savasta, Léon Tremblay, Jean-Louis Quesada, Jean-Luc Bosson, Alim-Louis Benabid, Emmanuel Broussolle, Pierre Pollak and Paul Krack

Brain 2010
Parkinsonian apathy responds to dopaminergic stimulation of D2/D3 receptors with piribedil

Stéphane Thobois,1,2 Eugénie Lhomée,3 Hélène Klinger,1 Claire Ardouin,3 Emmanuelle Schmitt,3 Amélie Bichon,3 Andrea Kistner,3 Anna Castrioto,3 Jing Xie,1 Valerie Fraix,3 Pierre Pelissier,3 Stephan Chabardes,4 Patrick Mertens,5 Jean-Louis Quesada,6 Jean-Luc Bosson,6 Pierre Pollak,3 Emmanuel Broussolle1,2 and Paul Krack3

[Diagram showing the effect of piribedil and placebo on apathetic patients over 12 weeks]
CHRONIC BEHAVIORAL ISSUES

Lhomme et al. 2012, Castrioto et al. 2014
CHRONIC BEHAVIORAL ISSUES

- Hypodopaminergic behaviors
  - ↑ dopamine agonists

- Hyperdopaminergic behaviors
  - ↓ dopamine agonists
  - Change parameters (if time-locked to stimulation)
THANK YOU FOR YOUR ATTENTION