PD ExpertBriefing: Understanding Pain in Parkinson’s Disease

Presented By:
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Welcoming Remarks

Robin Elliott
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PD Expert Briefing:
Understanding Pain in Parkinson’s Disease

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Parkinson’s Disease Foundation
Hope through Research • Education • Advocacy
Objectives

• Gain a better understanding of the prevalence of pain in Parkinson’s disease (PD)
• Learn about the signs, symptoms, and manifestations of pain as it is relates to PD
• Learn about the experience of pain from the perspective of individuals with PD
• Learn about current treatments for pain in PD
Pain

Pain of any type is the most common reason for physician consultation in the United States, prompting half of all Americans to seek medical care annually.

(International Association for Pain Relief, 2005; Philip, 2007).
Pain is Multi-Dimensional

An unpleasant sensory and emotional experience associated with actual or potential physical damage

- Physical
- Perceptual
- Cognitive
- Emotional
- Behavioral
Consequences of Unrelieved Pain

- Pain/Untreated Pain
- Exacerbation of Co-morbidities
- Increased Healthcare Costs

Consequences

- Sleep Disturbance; Malnutrition
- Social Withdrawal
- Physical & Functional Decline
- Depression Anxiety & Impaired Cognition
Pain in PD

• Pain is subjective, difficult to describe and poorly understood in persons with Parkinson’s disease (PWP)

• In PD, 40 to 85% report pain as the second most troublesome symptom after mobility (Brefel-Courbon, et al., 2009; Lee, et al, 2007)

• Pain is often reported prior to the confirmation of a PD diagnosis (Bunting-Perry et al., 2010; Quinn et al., 1986; Vaserman-Lehuede & Verin, 1999).

• Pain in PD is often disabling
Pain in PD

• Underassessed
• Underdiagnosed
• Undertreated

(Brefel-Courbon, et al., 2009; Lee, et al, 2006)
Assessing Pain

• Clinical Interview
• Utilization of a guiding theoretical framework from pain research
• Verbal rating from zero to 10 (0=no pain; 10=worst imaginable pain)
• Valid pain measures (currently lacking when clinicians perform the assessment)
• Consistent measures of pain
Components of a Pain Model

(Cognitive Processes (Attention & Beliefs))

(Emotional-Affective System (Depression & Affective Quality))

(Receptor System (Types and Classification of Pain))

(Perceptual Sensory System (Severity & Sensory Quality))

(Pain Behavior/Response System (Interference))

Pain Stimulus (cause of pain)

(Rugh, 1987, as cited in Bunting-Perry et al., 2010)
Pain Stimulus in PD

Injury or disease causing unpleasant sensory symptoms

(Pasero, 2004)
Pain Stimulus

- Related to PD Symptoms
  - Muscle tremor
  - Rigidity
  - Postural changes imposed by rigidity
  - Dystonia
  - Dyskinesia
  - Motor fluctuation
  - Pain associated to traumatic consequences from falls associated with gait and postural control difficulty
  - Akathesia (internal restlessness)

Broetz, et al., 2007; Bunting-Perry et al., 2010; Carr et al., 2003; Carroll et al., 2004; Ford, 1998; Loher, et al., 2002; Stacy et al., 2005; Wielinski et al., 2005
Other Causes of Pain in PD (Pain Stimulus)

- Fluctuations in pain severity due to dopaminergic medications such as Levodopa (Nebe & Ebersbach, 2009; Stacy et al., 2005)
  - Loss of dopamine producing cells results in classic motor symptoms of PD (tremor, rigidity, and bradykinesia) and contributes to abnormal modulation of pain centrally by activation of spinal cord neurons, through dopaminergic descending pathways (Greco et al., 2008; Mylius et al., 2009)
  - Individuals in the “on” levadopa state reports less pain than those in the “off” levodopa state (Lim et al., 2008; Nebe & Ebersbach, 2009; Schestatsky et al., 2007)
Other Causes of Pain in PD (Pain Stimulus)

• Pre-existing co-morbid conditions:
  – Osteoarthritis
  – Postherpetic neuralgia
  – Peripheral neuropathy

(Brefel-Courbon et al., 2009; Sage, 2004; Schmader & Dworkin, 2005)
Receptor System

• The detection and transmission of peripheral sensory (pain) information which is modified at spinal levels along sensory pathways of the central nervous system (Woolf, 2004)

• Classification of nociceptive, neuropathic, or a mixed pain syndrome
Receptor System

• Nociceptive pain
  – Normal transmission of pain from tissue that is injured or has the potential to be damaged if a pain is prolonged (McCaffery & Pasero, 1999)
  
  – Often presents as aching, sharp, or throbbing sensation
  
  – Causes: persistent tremor, muscle rigidity, dystonia, musculoskeletal injury from falls
Receptor System

• Neuropathic Pain
  – Abnormal transmission of pain in the peripheral or central nervous system
  – Diabetic neuropathy, herpes zoster, alcoholic neuropathy, complex regional pain syndrome, HIV sensory neuropathy (Pasero, 2004)
  – In PD, abnormalities in pain modulation related to levodopa therapy and motor fluctuation, dystonia and akathesia (Potvin et al., 2009; Tinazzi et al., 2008; Tinazzi et al, 2009)
  – Often presents as burning, numbness, tingling, touch sensitivity, sharp and shooting sensations or electric shocks
Emotional-affective system

- Emotional factors can increase or decrease the nerve impulses from peripheral nociceptors, and thus modify the patient’s perception of pain (Rugh, 1987)

- Defined as depression and affective pain experience

- Depression, which is prevalent in approximately 40% of individuals diagnosed with PD (Marsh et al., 2006; Wertheimer et al., 2004), plays an important role in the modulation of pain and pain perception in the elderly (Gagliese & Melzack, 2006)
Emotional-Affective System

• Affective Quality Characteristics:
  – The ability to describe a painful stimulus in terms of tension, fear, and punishment (Katz & Melzack, 1999)
Cognitive Processes

• Attention and beliefs, which influence the perception and reaction to pain (Rugh, 1987)

• Beliefs regarding pain:
  – An individual’s judgment about painful stimuli as irrelevant, benign, or stressful (Sullivan et al., 2001)
  – Rumination, magnification, and helplessness associated with pain (Sullivan et al., 2005; Sullivan et al., 2001)
Perceptual-Sensory System

- Recognition of a painful stimulus (Rugh, 1987)
- The ability to recognize the severity and sensory quality of pain (Melzack, 2001)
- Pain is often measured with self-report, typically on a zero to 10 (no pain to the worst pain imaginable) (Blozik et al., 2007)
- Sensory characteristics of pain are measured through word descriptors related to temporal, spatial, pressure, and thermal characteristics (Melzack & Katz, 2006)
Pain Behavioral Response System

• The degree to which actual or anticipated pain negatively affects or interferes with
  – Day-to-day activities
  – Mood
  – Sleep
  – Enjoyment of life
  (Tan et al., 2004)

• Contributes to disability
Effects of Unrelieved Pain

- Increased physiologic stress
- Diminished immuno-competence
- Reduced mobility
- Increased effort to breathe
- Increased myocardial oxygen demands
- Spiritual/existential despair
- Depression
- Anxiety
Understanding Pain in Parkinson’s Disease for Individuals with and without Deep Brain Stimulation: The Patient’s Perspective

Deep Brain Stimulator (DBS) Implantation

Human thalamic deep brain stimulation

monopolar
-3V 90µs 130Hz

High Impedance Model
1244 Ω

Low Impedance Model
741 Ω
DBS Targets and the SNC
Objectives

1. To examine and better understand the experiences that PWP may have with pain

2. To compare the experience of pain in PWP who have undergone DBS (DBS group) to those who have not had DBS (Non-DBS group)
### Demographics and Clinical Features of the Sample

<table>
<thead>
<tr>
<th>Variable</th>
<th>DBS (n=161)</th>
<th>Non-DBS (n=193)</th>
<th>p</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mean Age in years (SD; range)</td>
<td>64 (8.65; 45-88)</td>
<td>69 (9.48; 40-98)</td>
<td>.000*</td>
</tr>
<tr>
<td>Duration of PD in years (SD)</td>
<td>15 (6.05)</td>
<td>8 (5.74)</td>
<td>.000*</td>
</tr>
<tr>
<td>Percent Male</td>
<td>62%</td>
<td>58%</td>
<td></td>
</tr>
<tr>
<td>Percent Married</td>
<td>77%</td>
<td>74%</td>
<td></td>
</tr>
<tr>
<td>Percent Living with Someone</td>
<td>89%</td>
<td>83%</td>
<td></td>
</tr>
<tr>
<td>Mean Age of PD onset (SD; range)</td>
<td>49 (9.15; 26-72)</td>
<td>61 (10.56; 36-89)</td>
<td>.000*</td>
</tr>
<tr>
<td>Age at Time of DBS (SD; range)</td>
<td>59 (8.71; 41-81)</td>
<td>n/a</td>
<td></td>
</tr>
<tr>
<td>Average Time since DBS-STN (in years)</td>
<td>5.4</td>
<td>n/a</td>
<td></td>
</tr>
<tr>
<td>DBS Target STN</td>
<td>86%</td>
<td>n/a</td>
<td></td>
</tr>
<tr>
<td>Bilateral Stimulation</td>
<td>90%</td>
<td>n/a</td>
<td></td>
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</tbody>
</table>
Age Categories: DBS and Non-DBS Groups

- In the 50-69 age group, 113 participants were in the DBS group and 102 were in the Non-DBS group.
- In the 70+ age group, 86 participants were in the DBS group and 41 were in the Non-DBS group.
Findings
Results

- The majority of both groups endorsed significant elevations of pain:
  - **DBS group** = 79%
  - **Non-DBS group** = 82%.
- Most participants believed their pain was directly related to PD:
  - **DBS group** = 79%
  - **Non-DBS group** = 73%.
- 64% of both the **DBS group** and **Non-DBS group** rated the pain experience between “discomfort” and “excruciating”
## Pain Severity Rating: Short Form-McGill Pain Questionnaire

<table>
<thead>
<tr>
<th>Severity Rating</th>
<th>% of DBS Participants (n=161)</th>
<th>% of Non-DBS Participants (n=193)</th>
</tr>
</thead>
<tbody>
<tr>
<td>No pain</td>
<td>21%</td>
<td>18%</td>
</tr>
<tr>
<td>Mild</td>
<td>15%</td>
<td>18%</td>
</tr>
<tr>
<td>Discomfort</td>
<td>33%</td>
<td>31%</td>
</tr>
<tr>
<td>Distressing</td>
<td>25%</td>
<td>26%</td>
</tr>
<tr>
<td>Horrible</td>
<td>5%</td>
<td>6%</td>
</tr>
<tr>
<td>Excruciating</td>
<td>1%</td>
<td>1%</td>
</tr>
</tbody>
</table>
Brief Pain Inventory:
Pain ratings within the last 24 hours

10 = pain as bad as one can imagine
0 = no pain

Average Pain: 3.5 (DBS), 3.5 (Non-DBS)
Least Pain: 1.6 (DBS), 1.6 (Non-DBS)
Worst Pain: 4.5 (DBS), 4.6 (Non-DBS)
Current Pain: 2.4 (DBS), 2.4 (Non-DBS)
Level of Pain Interference in Activities of Daily Living

10= complete pain interference
0=no pain interference

General Activity: 3.5 DBS, 3 Non-DBS
Mood: 3 DBS, 3.3 Non-DBS
Walking: 4.3 DBS, 3.6 Non-DBS
Work/Housework: 4.2 DBS, 3.9 Non-DBS
Relationships: 2.9 DBS, 2.3 Non-DBS
Sleep: 3.3 DBS, 2.7 Non-DBS
Enjoyment in Life: 3.8 DBS, 3.6 Non-DBS

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Characteristics of the Pain Experience

• No difference in how the **DBS group** and **Non-DBS group** characterized pain.

• >50% participants in each group described their pain as cramping (physical), aching (physical), and tiring/exhausting (emotional).

• 35-50% of both groups characterized their pain symptoms as sharp and tender (physical).
Characteristics of the Pain Experience

• 25-35% of the participants in both groups characterized their pain symptoms as throbbing, shooting, stabbing, hot/burning, and heavy (physical)

• <25% endorsed the pain descriptors of gnawing and splitting (physical)

• <25% of each group described their pain as punishing, fearful, or sickening (emotional)
“Younger PD group” (50-69 years old) versus “Older PD group” (70+ years old)

• Similar pain ratings for the Younger (n=215) and Older PD groups (n=127)
  – Younger PD group reported an average pain level of 3.61
  – Older PD group reported an average pain level of 3.27
  – Both in the mild-to-moderate pain range

• Similar rating for pain interference in some activities of daily living for both the Younger and Older PD groups

• The majority of both groups attributed pain to nociceptive pain, particularly pain due to musculoskeletal injury (aching muscles and joints)

• The Older PD group reported more radicular and neuritic pain than the Younger PD group (p=.002)
Pain as it Relates to “Early versus Advanced PD”

- The average time from symptom onset to development of motor complications was 6 years (Politis et al., 2010; Shrag & Quinn, 2000).
  - Early PD: <6 years duration
  - Advanced PD: 6+ years duration
Pain as it Relates to “Early versus Advanced PD”

• Similar pain levels between Early PD group (n=81) and Advanced PD group (n=273):
  – Early PD group reported an average pain level of 3.15
  – Advanced PD group reported an average pain level of 3.59
  – Both were in the mild-to-moderate pain levels

• The Advanced PD group endorsed more pain interference in some activities of daily living than the Early PD group ($p=.03$).

• Both groups primarily attributed their pain to nociceptive pain, particularly musculoskeletal pain (aching muscles and joints)

• The Advanced PD group endorsed greater pain related to dystonia and akathisia
Limitations

• Convenience sample
• Sample bias
• Self-report
Pain Management
Common Interventions for Pain

- Medications
- Physical Therapy
- Stretching
- Exercise (walking, yoga, tai chi, weight routine, etc.)
- Massage
- Acupuncture/Acupressure
- Psychotherapy/counseling with an emphasis on pain management
- Nutrition (management of nutrition)
Pain Management

• Best Medical Practice
  – Non-pharmacological approaches used adjunctively with conventional pharmacological treatments.

• “To Do List” for the individuals with pain:
  – Tell your doctors
  – Ask about types of treatment
  – Document: when, where, description, and what has or has not helped
Pain Management

- **DBS and Non-DBS** groups had similar pain relief from treatment/medication, with the average rating of 5 (0=no relief; 10=complete relief)

- 43% participants were currently engaged in pain treatment:

  - 24% Neurologist
  - 15% Primary Care Physician
  - 15% Physical Therapist
  - 8% Chiropractor or Acupuncturist
  - 7% Massage Therapist
  - 5% Pain Specialist
  - 5% Nurse Practitioner
  - <1% Psychologist
  - <1% Anesthesiologist

  Wertheimer, et al., 2010
Pain Management

• Out of the common pain interventions, including medications, stretching, exercise, massage, acupuncture, psychotherapy, nutrition, and other (e.g., ice and heat, laying down), medications and exercise were deemed the most helpful

• 51% of participants receiving pain medications indicated that the medications were helpful

Wertheimer, et al., 2010
Pain Management

- Those receiving pain treatment, 98% indicated treatment was helpful:
  - 16% stated that it was “a little bit” helpful
  - 45% stated that it was “moderately” helpful
  - 31% reported that it was “quite a bit” helpful
  - 8% reported that it was “extremely” helpful
Conclusions

• Pain in PD is complex and multi-dimensional
• It is clear that pain in PWP is prevalent, under-assessed, and undertreated, having a pervasive psychosocial impact on patients and their families
• As PD progresses, pain appears to interfere with general life activity in greater levels when compared to those in the earlier stages of PD, regardless of the age of the individual
• Thorough, valid pain assessment and treatment at various time points during the progression of PD is indicated
• Remember your “To do list”
Questions and Answers
Closing Remarks

Robin Elliott
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Parkinson’s Disease Foundation