Critical Review:

s Disease

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Abstract

This systematic review examined the effects of subthalamic nucleus deep brain stimulation (STN-DBS) on speech in individuals with Parkinson's disease in nine studies. Study designs included: four non-experimental studies (one case study, one survey study, one systematic review, one expert opinion) and five quasi-experimental studies (one case control study, three treatment studies, one clinical trial study). The evidence from this review indicated that STN-DBS did not appear to provide positive outcomes for speech production in Parkinson's disease.

Introduction

Canada's population is aging and will continue to do so at an accelerated pace between 2009 and 2031; a period during which all baby boomers will become seniors ($\geq$65 years). Between the years 2015 and 2021, the number of seniors is projected to surpass the number of children ($\leq$14 years), a first in Canadian population history. Seniors will represent 23-25% of the population by 2036 (Stats Canada 2009). Although Parkinson's disease (PD) only affects about 2-3% of Canadians over the age of 60 (Parkinson's Society Canada), the number of people affected by PD will continue to increase as the senior population grows.

Parkinson's disease is a neurodegenerative disease caused by the deterioration of dopaminergic neurons in the brain stem and the basal ganglia. The primary symptoms of PD include muscle rigidity, bradykinesia, resting tremor, and impaired balance (Brookshire, 2007). Motor speech difficulties are commonly associated with PD. In fact 60% or more of PD patients will develop symptoms of hypokinetic dysarthria. Hypokinetic dysarthria is characterized by monopitch, monoloudness, reduced stress, short phrases, variable rate, short rushes of speech, imprecise consonants, inappropriate silences, harsh voice quality, a constant breathy voice, and low pitch (Duffy, 2005).

The treatment of PD with the drug, levodopa, is

one systematic review, one expert opinion) and five quasi-experimental studies (one case control study, three treatment studies, one clinical trial study). Articles included in the systematic review were not included as separate individual studies in this review.

Results

Nonexperimental
Expert Opinion
Murdoch (2010) reviewed and evaluated the literature related to the effects of surgical interventions for PD. Of greatest concern to this paper was the section titled "Effects of deep brain stimulation on speech" (p. 381). Based on the author's review of the literature insufficient evidence existed regarding speech outcomes in PD patients with DBS. DBS has been reported to have no effect, minor positive effects

and a thorough description of the methods. The validity of the study was strengthened by its use of two control groups, well-matched PD groups, and double-blind procedures. The results suggested STN-DBS may provide measurable improvement in patients with severe vocal impairment; however, it was not stated whether the improvements were noticeable perceptually. Overall, this study provides compelling evidence that STN-DBS has a beneficial effect on voice outcomes.

Treatment Studies (3)
Fasano, Romito, Daniele, Piano, Zinno, Bentivoglio, & Albanese (2010) investigated the long-term motor and cognitive outcomes in 20 consecutive PD patients who underwent bilateral STN-DBS implantation 8 years prior to the study.

The UPDRS was used to evaluate motor function beginning at baseline (prior to surgery) and continuing until 8 years post-surgery. UPDRS i

magnitude of the frequency tremor for med-off-stim on vs. med off-stim off. Together these results indicate an improvement in vocal tremor and glottal vibration. No significant variation in acoustic measures was observed for prosody, articulation or intensity.

This study included appropriate inclusion and exclusion criteria as well as an adequate description of the methods. The validity of the study was limited by its small sample size. Furthermore, the improvements noted in this study did not lead to improved intelligibility. Overall, this study provides somewhat suggestive evidence that STN-DBS improves speech production outcomes.

Clinical Trial Study with healthy controls
Putzer, Barry, & Moringlane (2008) compared the