STUDENT CASE STUDY AWARDS

FIRST PLACE WINNER

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Case Study: The effects of passive ranges of motion, ROOD's techniques and hydrotherapy on a patient with long standing parkinson’s disease and Type II diabetes
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ABSTRACT

Objective To investigate the effects of passive range of motion (PROM), ROOD’s techniques, and deep moist heat (DMH) on treating the symptoms of a patient with long standing Parkinson’s disease (PD).

Design Case Study Design

Setting Student Massage Therapy clinic, Burnaby with treatments being administered in private rooms for treatment.

Participant A 72-year-old female who was diagnosed with PD approximately 8 years ago. The patient had experienced benefits with massage before, but had not had manual therapy treatments in the recent past leading up to the case study treatment period; they were not a part of any other PD studies.

Intervention The case study was done over 6 visits consisting of 5 treatments, an initial baseline assessment, and a final reassessment. Manual therapy in the form of PROM and ROOD’s techniques were used, as well as deep moist heat as a form of hydrotherapy.

Main Outcome Measures Modified MDS-UPDRS and PDQ-39 questionnaires, patient feedback, postural assessment, gait analysis and various special tests.

Results The combination of hydrotherapy and massage therapy proved to be beneficial in reducing the symptoms of a PD patient. The patient experienced an improved gait, better posture, a decrease in resting tremors and a decrease in rigidity of movements post treatments.

Conclusion Massage therapy proved to be beneficial for short-term symptomatic relief in PD patients. The hypothesis was accepted, as PROM and ROOD’s techniques, together with DMH decreased the signs and symptoms in a Parkinson’s patient.

Keywords: Parkinson’s disease, Massage, Hydrotherapy, ROOD’s techniques
INTRODUCTION

Parkinson’s disease (PD) is a progressive neurodegenerative disorder that involves a reduction in the function of the basal ganglia. This disorder results in slow, increasingly difficult movements, which are accompanied by muscular rigidity and resting tremors (Lewis, 2013). Parkinson’s is a pathology that affects people later on in life, most commonly in an individual’s sixth decade, but with age the likelihood of developing the disease increases (Rattray & Ludwig, 2000). Statistics Canada recently published a study that ranked Parkinson’s disease second in line, after Alzheimer’s, for being the most prevalent neurodegenerative disease (Wong, Gilmour & Ramage-Morin, 2014). According to Rattray & Ludwig (2000), Parkinson’s “...[A]ffects one out of 1000 under the age of 60, with only one of seven diagnoses made of people under the age of 50.” Approximately five percent of the population suffering with PD are those with young-onset from ages 21-39 years (Rattray & Ludwig, 2000).

Many resources have been used to study PD throughout the years, but to this day no cure has been found (Sorrentino & Remmert, 2013). Like this case study, a focus of many researchers has been on noninvasive treatments to help slow the progression of the disease or lessen the severity of the signs and symptoms associated with Parkinson’s (Parkinson’s Society British Columbia, 2014). There was a pilot observational study undertaken in which PD patients were treated with a one hour, full body massage for 8 consecutive weeks (Patterson, Allen, Browning, Barlow & Ewings, 2005). Through the use of hands on relaxation massage, Patterson et al., (2005), were successful in improving the subjects’ “[S]elf-confidence, well-being, walking and activities of daily living.” In both a randomized control pilot study done by Volpe, Giantin, Maestri & Frazzitta, (2014) and an open-label pilot study done by Vivas, Arias, Cudeiro, (2011), hydrotherapy based exercise was measured against land-based exercise in patients with PD and
benefits were seen in both groups. The previously mentioned studies are two of the very few done on the benefits of massage therapy and hydrotherapy (not in tandem) as a symptomatic treatment for patients suffering with Parkinson's disease (Martin, 2005). Further research is needed to see the benefits of particular massage techniques and specific modalities of hydro applications in the symptomatic treatment of patients with Parkinson’s disease.

The aim of this case study was to investigate the effects of massage therapy on the signs and symptoms associated with Parkinson’s disease. It was hypothesized that passive range of motion (PROM), ROOD’s techniques (refer to Appendix G), and hydrotherapy would, in combination, decrease the signs and symptoms of a patient with longstanding Parkinson’s disease. In turn, the null hypothesis for this case study was that PROM, ROOD’s techniques, and hydrotherapy would not decrease the signs and symptoms of a patient with longstanding Parkinson’s disease. The hydrotherapy chosen in this case study was deep moist heat. The primary focus of this case study was decreasing the muscle rigidity and tremors as well as improving the overall gait of the patient (steadiness, ease and flow). Secondarily, improving effective breathing and handwriting skills were targeted.

For the purpose of this case study, an elderly female patient who was diagnosed with PD 8 years ago, amongst a wide variety of other health conditions, was treated with the aforementioned massage techniques. The baseline assessment was done two days prior to the initial treatment, giving a total of six assessments and five treatments; the patient was assessed before and after each treatment.
Definition

In 1817, Dr. James Parkinson documented the first clinical case of Parkinson’s disease; much of the data he collected is still relevant today (Rattray & Ludwig, 2000). Parkinson’s disease is a progressive neurological disorder that involves the destruction of dopamine cells within the basal ganglia of the brain (Sorrentino & Remmert, 2013).

Pathophysiology

According to the Parkinson’s Society of British Columbia (2014), a diminished amount of dopamine in the substantia nigra of the brain and, “…[T]he presence of Lewy bodies in selected regions of the brain…” leads to the progression of PD as the Lewy bodies accelerate the decline in mental abilities (Chen, H., 2013). Many neurologists have found that an alarming number of patients with PD show a decreased level of cortical neurons, which is indicative of dementia; the connection between the two pathologies is undetermined (Gould & Dyer, 2011).

The basal ganglia control learning, movement, emotion, and several other important functions of the body. The substantia nigra, which is located within the basal ganglia of the midbrain, is a large pigmented nucleus (Rattray & Ludwig, 2000). The substantia nigra is made up of two sections, the pars reticulata and the pars compacta (Encyclopedia Britannica, 2014). The dark pigment, melanin, is found within the cells of the pars compacta portion of the substantia nigra; “…these cells synthesize dopamine and project to… [other] structures of the basal ganglia [that] are involved in mediating movement and coordination” (Encyclopedia Britannica, 2014). The smooth transmission of messages from one neuron to another is overseen by the chemical messenger, or inhibitory neurotransmitter, dopamine (Rattray & Ludwig, 2000). Rattray & Ludwig, (2000) revealed that, “…[W]hen the concentration of dopamine diminishes to 60 to 80
percent in the neurons and 80 percent in the basal ganglia...” an imbalance between excitation and inhibition in the basal nuclei occurs and Parkinsonian symptoms are experienced (Gould & Dyer, 2011). “As dopamine continues to decrease, muscle movements become slower and more rigid, tremors can develop and reflexes become more impaired contributing to a loss of balance” as well as a loss of overall control of intentional voluntary body movements (PSBC, 2014).

According to the Hoehn-Yahr Scale, there are 5 stages of Parkinson’s disease (Figure 1).

Unfortunately the patient was unaware of which stage they were at, but for the purpose of this case study, through subjective and objective findings, they were placed between stages 3 and 4. The patient was not at a stage of severe disability, but they were requiring assistance with some activities of daily living (ADLs).

### Progression

Parkinsons progresses slowly or rapidly, with mild or severe symptoms. The Hoehn-Yahr Scale is used to evaluate the disability of PD (Grimes et al., 1994; Lieberman, Williams, 1993):

- **Stage 1:** One side of the body is involved. Usually rigidity or tremors are present. If the symptoms are mild, no treatment is given; if they are moderate, physiotherapy and massage are helpful.
- **Stage 2:** Both sides of the body are involved. Moderate tremors, rigidity and bradykinesia are present. Balance is not affected. Levodopa drug therapy may begin.
- **Stage 3:** Significant tremors, rigidity and bradykinesia are present. Balance and walking are now impaired. Other symptoms include unsteadiness, dystonia and freezing.
- **Stage 4:** Increasingly severe disability results because of severe bradykinesia. While walking is still possible, there is marked impairment. Some assistance is required with activities of daily living.
- **Stage 5:** There is a loss of ability to function independently. The person is immobile.

**Figure 1 – The Hoehn-Yahr Scale to Categorize the 5 stages of PD**
(Rattray & Ludwig, 2000)

### Etiology
In Canada, it is predicted that, per annum, 5,500 individuals develop Parkinson's disease, resulting in up to 100,000 Canadians suffering with PD, and 11,000 cases presenting in British Columbia (PSBC, 2014). Both primary and idiopathic Parkinson's disease tend to develop after age 60, in males and females alike (Gould & Dyer, 2011). According to MedicineNet (2014), men are 1.5 times more likely to develop PD than women; the patient for this case study was a female. Although a small percentage of individuals are affected by PD, the Parkinson's Society of British Columbia (2014) found that each hour a PD patient dies due to complications and every nine minutes a new diagnosis of PD is made in North America.

Most reported cases of PD are idiopathic in nature. Many genetic factors have been identified in familial causes of Parkinson's disease. In the recent past, six genes have been identified as causative factors for familial Parkinson's, "Specifically, mutations in α-synuclein, parkin, UCHL1, DJ1, PINK1, and LRRK2 cause PD, with a Mendelian pattern of inheritance" (Schapira, 2006).

Another focus of research has been on the possible harmful effects of toxins or viruses on the cells (Gould & Dyer, 2011). More recent studies have "...[F]ocused on the mitochondrial changes in cells from patients with [PD]; these changes suggest periods of significant oxidative stress leading to the accumulation of free radicals within the cells" (Gould & Dyer, 2011). Lai & Tsui (2001) found that the prevalence of PD was greatest in European and North American Caucasians and that low socioeconomic factors that affect survival rates easily affect the prevalence of the disease. Researchers hypothesize that approximately 90% of PD is caused by a combination of genetic and environmental factors, so "...[A]voiding certain environmental triggers may prevent some individuals from developing the disease" (MedicineNet, 2014).
Other pathologies such as brain tumors, repetitive head trauma, vascular disease, or even iatrogenic drug use can cause Secondary Parkinsonism, also known as Parkinson’s-plus syndrome, as seen in patients such as the famous boxer Muhammad Ali. “Drug-induced Parkinson's disease is linked particularly to use of the phenothiazines (e.g., chlorpromazine),” however, the effects of the drug can be decreased or even reversed once the drug is no longer being taken (Gould & Dyer, 2011).

**Signs and Symptoms**

The initial onset of Parkinson’s is subtle and varies widely from person to person. It can start off “...[with] a slight stoop in the shoulders, a lack of swing in one arm when walking, obscure muscular aches and cramps or a tremor in one finger” (Rattray & Ludwig, 2000). According to Rattray & Ludwig (2000), over half the diseased population initially presents with a mild tremor, but since most people assume this occurs as part of the aging process, the disease goes undiagnosed for years.

The symptoms associated with PD usually start on one side of the body and eventually develop into bilateral presentation. As the patient ages, the disease progresses and, “What began as a slight stoop to the shoulders will also include a head-forward posture[,] hyperkyphosis of the torso [and over time, increased flexion of the elbows, hips and knees will occur]” (Figure 2a -b) (Rattray & Ludwig, 2000). Fine motor movement control is often affected by the presence of the tremors; things such as buttoning up a shirt, handwriting and tying shoelaces become increasingly difficult (Rattray & Ludwig, 2000). The patient may begin to experience “[D]ifficulty in changing positions in bed or in standing up,” such as with this case study patient who needed to replace their bed at home with a hospital style bed equipped with railings (Rattray
The difficulties mentioned above, that arise as the disease progresses, are said to be the beginning signs of bradykinesia, which is a difficulty in initiating movement (Rattray & Ludwig, 2000).

The clinical diagnosis of Parkinson's is based on three main symptoms, these being a resting tremor, rigidity and akinesia, impairment in voluntary movement (Chen, H., 2013). Akinesia leads to "...[B]radykinesia, or slowness, and small movements" (MedicineNet, 2014). Patients who exhibit micrographia (small handwriting) and a decrease or loss of facial expression, "...[T]ermed a 'masked face,'" are said to have bradykinesia (Rattray & Ludwig, 2000;
‘Pill rolling’ is the term used to describe the characteristic tremors exhibited in the hands of PD patients (refer to Figure 3). Two other signs and symptoms that are not used to diagnose PD, but are commonly seen in patients are, a stooped posture and a stare that seems both serious and weakened at the same time. See Figure 4 for a mnemonic to assist in remembering the most common signs and symptoms of PD. Some other secondary symptoms include changes in speech, changes in handwriting, difficulty breathing, sleep disorders, depression, mental retardation, constipation, and freezing phenomenon, the sudden inability to move (Rattray & Ludwig, 2000).

**Figure 3 – Pill rolling hand** (Magee, 2008)

<table>
<thead>
<tr>
<th>Parkinsonism: essential features</th>
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</thead>
<tbody>
<tr>
<td><strong>TRAPS:</strong></td>
</tr>
<tr>
<td>Tremor (resting tremor)</td>
</tr>
<tr>
<td>Rigidity</td>
</tr>
<tr>
<td>Akinesia</td>
</tr>
<tr>
<td>Postural changes (stooped)</td>
</tr>
<tr>
<td>Stare (serpentine stare)</td>
</tr>
</tbody>
</table>

*To remember what kind of tremor and postural change, can look at letter that follows in TRAPS: Tremor is Resting, Posture is Stooped.*

**Figure 4 – Parkinson’s Signs and Symptoms Mnemonic**
(World’s Database of Medical Mnemonics, 2014)

Once the pathology has begun to progress, Parkinson’s patients develop a very distinct walk, this is known as festinating gait, or shuffling (Rattray & Ludwig, 2000). Festination, or a propulsive
gait is characterized by “...[S]hort, shuffling steps with increasing acceleration...” (Gould & Dyer, 2011) while the individual keeps their limbs, torso and neck flexed and laboriously moves the arms (Magee, 2008; Rattray & Ludwig, 2000).

**Types of Treatment**

Parkinson’s Disease cannot be cured. There have been many studies done on PD patients to try and find a solution for the symptoms that they are experiencing, but unfortunately that is all that has been found, symptomatic relief (Rattray & Ludwig, 2000). Medications have been noted to be the best form of symptomatic treatment for PD patients, however, the effects are short lived and majority of patients feel the drugs wear off over the years. This causes patients to increase their dose, change medications, or use a cocktail of medications to try and balance out the effects (Rattray & Ludwig, 2000). Living with PD is a financial burden; it is estimated that Canadians living with PD spend about $1000 a month on medications alone (PSBC, 2014).

**Drug Therapy**

**Levodopa**

Dopamine replacement therapy is used to help decrease motor impairment in PD patients. Levodopa (L-dopa) is the most commonly administered drug for PD (PSBC, 2014). It is a precursor to dopamine, and since dopamine cannot cross the blood-brain barrier, L-dopa is used instead and turns into dopamine once inside the brain (Gould & Dyer, 2011; PSBC, 2014). Levodopa is normally “…[C]ombined with either carbidopa (Sinemet) or benserazide (Prolopa) because these drugs facilitate the medication reaching the brain” (Rattray & Ludwig, 2000). Carbidopa-levodopa is usually the first choice in drugs (MedicineNet, 2014). Some of the side effects associated with levodopa are nausea, anorexia and dizziness, but by combining the drugs
there is a reduction in “...[N]ausea, low blood pressure and heart problems that can arise when levodopa is taken on its own” (Rattray & Ludwig, 2000).

Dopamine Agonists

Other drugs that mimic the action of dopamine are often used in treating patients with PD when the expected outcomes of carbidopa-levodopa fade; these drugs are called dopamine agonists (MedicineNet, 2014; PSBC, 2014; Mayo Clinic, 2014). Common dopamine agonists that are used are Apokyn, Mirapex, Parlodel, and Requip, all which have similar side effects to those of L-dopa (Mayo Clinic, 2014).

MAO-B Inhibitors

These drugs “...[H]elp prevent the breakdown of brain dopamine by inhibiting the brain enzyme monoamine oxidase B (MAO-B)” which is the enzyme that metabolizes dopamine within the brain (Gould & Dyer, 2011; Mayo Clinic, 2014). Selegiline (Eldepryl, Zelapar) and rasagiline (Azilect) are the commonly administered MAO-B inhibitors for PD patients. Side effects of MAO-B inhibitors are nausea and headaches, but when combined with carbidopa-levadopa, there is an increased risk of hallucinations (Mayo Clinic, 2014).

Catechol O-methyltransferase (COMT) inhibitors

The most common COMT inhibitor is Entacapone (Comtan). This medication helps in prolonging the effect of levodopa by blocking the enzyme Catechol O-methyltransferase, which like MAO-B, breaks down dopamine (Mayo Clinic, 2014). □

Anticholinergics
Many anticholinergic medications are available today to help control the tremor associated with PD. These medications include benztropine (Cogentin) or trihexyphenidyl (Mayo Clinic, 2014). These are the drugs that often cause "...[I]mpaired memory, confusion, hallucinations, constipation, dry mouth and impaired urination" (Mayo Clinic, 2014).

**Amantadine**

In the early-stages of PD, doctors may recommend amantadine on its own to offer short-term relief of symptoms (Mayo Clinic, 2014). Amantadine can also be prescribed in combination with carbidopa-levodopa therapy during the later stages of PD; the pairing of the drugs helps control involuntary movements (dyskinesias) brought on by carbidopa-levodopa (Mayo Clinic, 2014).

**Surgery**

**Deep brain stimulation**

Deep brain stimulation (DBS) is a surgery in which electrodes are implanted into a specific part of the brain. There is a generator implanted in the chest that sends electrical impulses to the brain and may decrease the symptoms of PD. Some risks involved in DBS are infections, stroke or brain hemorrhage. "DBS can stabilize medication fluctuations, reduce or halt involuntary movements (dyskinesias), reduce tremor, reduce rigidity, and improve slowing of movement" (Mayo Clinic, 2014). For this reason, the DBS procedure is often presented to people with advanced stages of PD who have experienced unstable responses to medications. Although DBS can cause a sustained benefit for PD symptoms maintained for years after the procedure, DBS does not halt the progression of PD (Mayo Clinic, 2014).

**Pallidotomy and Subthalamotomy**
There are more invasive surgeries, pallidotomy and subthalamotomy, that aim to either remove or damage nervous tissue. These surgeries are used when patients are not responding to medications for symptomatic relief of PD (MedicineNet, 2014). Many patients have had symptomatic relief with these surgeries; others have had complications due to the irreversible tissue damage in the brain. DBS is becoming the more common surgical choice amongst PD patients (MedicineNet, 2014).

**Lifestyle Changes**

Simple lifestyle habits can be addressed to help a PD patient live better with their presenting symptoms. Modifications such as yoga, eating healthier, and mild aerobic exercises, on land or in the water, are examples of lifestyle changes that can easily be incorporated into a PD patient’s daily life (PSBC, 2014).

**Prognosis**

Parkinson’s disease has very subtle initial symptoms that patients often confuse with old age since the pathology develops, most often, later on in life. Due to these confusing symptoms of weakness, tiredness, and mild tremors at the onset of the disease, patients often avoid seeing a doctor until symptoms become more severe or someone else brings the changes to the patients’ attention (PSBC, 2014). Unfortunately, there is no test besides a nervous tissue biopsy, done during an autopsy (postpartum), to officially diagnose Parkinson’s disease. Neurologists can make diagnoses, however, based on the TRAPS symptoms (refer to Figure 4) and differentially diagnose with an MRI and a CT scan.
PD is not a direct cause of death. Even though with age the mortality rates in PD patients rise, the life expectancy has increased overall in the recent past through medical interventions (Lai & Tsui, 2001). However today, "...[T]he life span of PD patients is still somewhat less than that of the general population" (Lai & Tsui, 2001). According to Rattray & Ludwig, (2000), since levadopa therapy was introduced the average lifespan of a PD patient from onset to death increased to 14 years from nine.

Lai & Tsui (2001) conducted a study that examined the prognosis of PD patients in Japan. Their research revealed that, regardless of age, pneumonia was the most common cause of death for all patients. Therefore, PD-related conditions should be treated more aggressively in tandem with the pathological treatments (Lai & Tsui, 2001).

**Massage Research**

Complementary and alternative medicine (CAM), similar to that of this case study, have become the focus of many researchers trying to find a means to help slow the progression of PD or lessen the severity of the signs and symptoms associated with it (PSBC, 2014). Patterson et al., (2005) undertook a pilot observational study in which PD patients were treated with a one-hour, full body massage for 8 consecutive weeks. Through the use of hands on relaxation massage, they were successful in improving the overall quality of life of the subjects’ by enabling them to complete their ADLs more easily (Patterson et al., 2005). This study is one of very few studies that focused on the benefits of massage therapy for PD patients.

In a more recent study conducted by Ferry, Johnson & Wallis, (2007), they found that “the most common agents for CAM that were being used by the PD patients were massage therapy and
aromatherapy”. This was an important finding “…[A]s it seems that patients with Parkinson’s disease were not primarily using pharmacologically-active complementary therapy, thus making the possibility of either drug interactions or adverse effects less likely” (Ferry, Johnson & Wallis, 2007). These British researchers were successful in differentiating their valuable findings from an earlier American study that revealed that certain vitamins and herbs were the most common forms of complementary therapies used by Parkinson’s patients to date (Ferry, Johnson & Wallis, 2007).

Volpe et al., (2014) conducted a randomized control pilot study, which compared hydrotherapy-based exercise with land-based exercise in patients with PD; benefits were seen in both groups. Vivas, Arias, Cudeiro, (2011) also conducted a study on the benefits of hydrotherapy verses land-based therapy; the hydro group had better results than the land group in decreasing the symptoms of PD. Although the hydrotherapy modality in these two studies refers to activities that physically took place inside the water rather than as an external application, as seen in this case study, hydro treatment was still administered. Mooventhan & Nivethitha, (2014) found that hydrotherapy modalities had beneficial effects on many systems in the body, and in particular they help manage pain in neurological pathologies such as PD. Unfortunately, they also concluded that “…[T]here is lack of evidence for the mechanism on how hydrotherapy improves these diseases, which is one of the limitations of hydrotherapy…” (Mooventhana & Nivethitha, 2014). Further research is needed to see the benefits of particular massage techniques and specific modalities of hydrotherapy applications in the symptomatic treatment of patients with Parkinson’s disease.
While conducting an evidence-based review with regards to CAM in the management of PD, Bega & Zadikoff, (2014) found that “...[M]anual interventions appear[ed] to be safe, [however,] data is too limited to make any firm conclusions, particularly with regard to effects on motor function.” Given the data, although it is scarce, there is no reason not to believe that these manual techniques could have a beneficial impact on the mood and subjective judgments of quality of life in patients with PD. Researchers may have been able to find that manual therapy has had temporary influence on motor function, “...[B]ut these outcomes need to be reproduced with more carefully designed studies” (Bega & Zadikoff, 2014).

Many registered massage therapists (RMT) are now working in interdisciplinary clinics. In this setting they are given opportunities to treat patients, refer to other health care practitioners in their own private practice and work collaboratively in bettering their patients’ overall health. While researching through various outlets, it became evident that to this day, “...[T]here are no [randomized control trials] investigating the effects of chiropractic manipulation in subjects with PD...” (Bega & Zadikoff, 2014). This is unfortunate, as chiropractors and RMTs work closely when it comes to patient care. Therefore, not only does further research need to be done on the effects of massage, but also the effects of chiropractic manipulations in treating a patient with Parkinson’s disease.
METHODS

Assessment Plan

A baseline assessment was done two days prior to the initial treatment and a full reassessment was completed at the final session. Both of these days consisted of a vast array of special tests, scans, and paperwork. There were also basic assessments done before and after every treatment.

Observation

During postural assessment, increased flexion in the torso and all four limbs were noted as well as drastic head forward posture (HFP). With the patient’s muscles constantly tensing up, the patient presented with very locked and fixed joints in the baseline assessment postural scan photos compared to later treatments (see Figures 5a-b in the baseline treatment section). Gait was quite rocky and unsteady pre-treatments, with a lot of jerky hand and wrist motions. The patient used a 4-legged cane in the right hand as an assistive device; she had started using the cane 6 months prior.

At the beginning of each session, a postural exam was performed to gain information of any initial or changing visual deformities, abnormalities in alignment and asymmetries that might have been present. Pictures of the plumb line postural scan as well as videos of the patient’s gait were obtained at the initial assessment as well as before and after each of the treatments.

Examination

For each session, orthopedic assessments were conducted on the treatment table during the actual hands-on treatment time; any abnormal or new findings were recorded. To determine detailed changes, full examinations were conducted twice during the six-week study period, on the initial and final treatments.
Special Tests

Various orthopaedic special tests were used to determine any contributing factors to the patient’s symptoms and to assess how advanced the presenting symptoms were. Special tests were done as directed in the RMT textbooks by Magee (2008) and Rattray & Ludwig (2000). All special tests, regardless of the testing results, were performed at both the initial and final assessments; all testing was done bilaterally. See Table 1 for list of special tests that were administered.

Table 1 – Special Tests Administered

<table>
<thead>
<tr>
<th>Special Test</th>
<th>Purpose</th>
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<tbody>
<tr>
<td>Active ROM (Glenohumeral (GH), elbow, wrist, fingers)</td>
<td>Range of Motion (ROM)</td>
</tr>
<tr>
<td>Passive ROM (GH, elbow, wrist, fingers)</td>
<td>Range of Motion (ROM)</td>
</tr>
<tr>
<td>Dermatomes (C3-T2, L1-S1)</td>
<td>Sensory</td>
</tr>
<tr>
<td>Myotomes (C4, C5, C6)</td>
<td>Strength</td>
</tr>
<tr>
<td>Deep Tendon Reflexes (DTR) (C5, C6, C7, L3/4)</td>
<td>Sensory</td>
</tr>
<tr>
<td>Babinski Sign</td>
<td>Sensory</td>
</tr>
<tr>
<td>Palommental Reflex</td>
<td>Sensory – Pathological Reflex</td>
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<tr>
<td>Dexterity Test</td>
<td>Cerebellar and Neurological Function</td>
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<tr>
<td>Figure-8 Test</td>
<td>Cerebellar and Neurological Function</td>
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<tr>
<td>Heel to knee test</td>
<td>Cerebellar and Neurological Function</td>
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<tr>
<td>Patting Test</td>
<td>Cerebellar and Neurological Function</td>
</tr>
<tr>
<td>Pronation-Supination Test</td>
<td>Cerebellar and Neurological Function</td>
</tr>
<tr>
<td>Position Sense Testing (hands and feet)</td>
<td>Cerebellar and Neurological Function</td>
</tr>
<tr>
<td>Romberg’s Test</td>
<td>Cerebellar and Neurological Function</td>
</tr>
<tr>
<td>Respiration Measure at 3 locations (axilla, nipple line &amp; xyphoid process)</td>
<td>Pathology Specific Testing</td>
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<tr>
<td>Percussions</td>
<td>Pathology Specific Testing</td>
</tr>
<tr>
<td>Machine to measure Inhalation (Triflo II)</td>
<td>Pathology Specific Testing</td>
</tr>
<tr>
<td>Ticking Watch test</td>
<td>Pathology Specific Testing</td>
</tr>
<tr>
<td>W-test (for piriformis)</td>
<td>Signs &amp; Symptoms Specific</td>
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<tr>
<td>Reverse Phalen’s</td>
<td>Signs &amp; Symptoms Specific</td>
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<tr>
<td>Phalen’s</td>
<td>Signs &amp; Symptoms Specific</td>
</tr>
<tr>
<td>Tinel’s on Median Nerve (at carpal tunnel)</td>
<td>Signs &amp; Symptoms Specific</td>
</tr>
</tbody>
</table>
Outcome Measure Tools

**MDS-UPDRS**

The Movement Disorder Society’s unified Parkinson’s disease rating scale (MDS-UPDRS) is a tool that was formulated for an investigator to understand the subjective and objective findings of a PD patient’s motor and non-motor experiences of daily living. It has proven to be a tool of choice in studies involving PD, however for the purpose of this case study it was simply used as a comparison tool, from baseline to termination of treatment, in the form of a questionnaire. To properly use the MDS-UPDRS one needs to submit a request for permission form and pay the fees to incorporate it into a study; this was avoided for this case study.

The patient had difficulty filling out the questionnaire, due to their resting tremors; the therapist was needed to scribe while the patient dictated their responses to the questions. The patient did not comprehend what was being asked in Part 4 and decided to skip it as it was causing emotional stress. Refer to Appendix E to review the completed MDS-UPDRS, in questionnaire format, at the beginning and end of the study period.

**PDQ-39**

The Parkinson’s Disease Questionnaire (PDQ-39) is a “...[S]ystematic attempt to develop a disease-specific measure which is completed by patients themselves” (Jenkinson, Fitzpatrick, Peto, Greenhall & Hyman, 1997).

This PD specific questionnaire was built on 8 dimensions; see Table 2. The before and after trial period results for this questionnaire can be found in Appendix F.
Table 2 – *The 8 Dimensions of PDQ-39*

<table>
<thead>
<tr>
<th>Dimension</th>
<th>No. of items</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mobility</td>
<td>10</td>
</tr>
<tr>
<td>Activities of daily living</td>
<td>6</td>
</tr>
<tr>
<td>Emotional well-being</td>
<td>6</td>
</tr>
<tr>
<td>Stigma</td>
<td>4</td>
</tr>
<tr>
<td>Social support</td>
<td>3</td>
</tr>
<tr>
<td>Cognitions</td>
<td>4</td>
</tr>
<tr>
<td>Communication</td>
<td>3</td>
</tr>
<tr>
<td>Bodily discomfort</td>
<td>3</td>
</tr>
</tbody>
</table>

*Videos & Photos*

The patient consented to having anonymous photographs and videos taken of them for the purpose of this case study. The photos that were taken consisted of 4 angles of postural scans before and after each treatment. Videos were taken of the patient’s gait, both before and after treatments, and of the patient performing some of the special tests, such as the breathing exercise using the Triflo II machine.

*Goniometer*

In treatment, a goniometer was used to measure the angle of abduction at the patient’s hip joint bilaterally. The measurements were taken before and after the area was treated. Refer to Appendix H, visits 3-5.

*Visual Analog Scale*

A visual analog scale (VAS) of 1 to 10 was used with the patient for pain assessment purposes, 1 being no pain and 10 being the worst pain they had ever experienced. In treatment, a different VAS was used, it ranged from 1 to 5, 1 being a light touch and 5 being excruciating pain. The aim of this case study was to always be treating in the 1 to 3 range of the 1 to 5 VAS.
Patient Profile

For the purpose of this case study, a 72 year old female, who was diagnosed with Parkinson’s disease approximately 8 years ago, consented to being assessed and treated (refer to Appendix A). It is interesting to note that the patient had a genetic connection to Parkinson’s, as it was indicated under family history of medical conditions (refer to Appendix B). This patient retired from working as a Home Care Support Worker when she was diagnosed with Parkinson’s; a year earlier than she was expecting to retire. The patient had multiple pathologies that coexisted, some systemic, others not. The patient presented with type II diabetes mellitus, hypertension, hypothyroidism, anemia, carpal tunnel syndrome (which was treated but symptoms were starting to reappear), and osteoarthritis, which was most predominant in the knees, but present in hands as well; see Appendix B, C & D. Although the patient had hypertension, post treatments they experienced orthostatic hypotension while coming off of the treatment table. Given all of the health conditions that the patient presented with, their doctor had them on a cocktail of medications; see Table 3 for a complete list of these medications.

Table 3 – Patient’s Prescription Medications

<table>
<thead>
<tr>
<th>Medication</th>
<th>Indicated Use</th>
</tr>
</thead>
<tbody>
<tr>
<td>PMS-LEVOCARB CR (100/25MG)</td>
<td>PARKINSON’S (DOPAMINE THERAPY)</td>
</tr>
<tr>
<td>APO-PRAMIPEXOLE (0.25MG)</td>
<td>PARKINSON’S (DOPAMINE AGONIST)</td>
</tr>
<tr>
<td>PMS-AMANTADINE (100MG)</td>
<td>PARKINSON’S (ANTIPARKINSONIAN)</td>
</tr>
<tr>
<td>FERAMEX (150MG)</td>
<td>IRON SUPPLEMENT (DEFICIENCY)</td>
</tr>
<tr>
<td>PMS-URSODIOL-C (500MG)</td>
<td>CHOLESTEROL</td>
</tr>
<tr>
<td>SYNTHROID (0.1MG)</td>
<td>HYPOTHYROIDISM</td>
</tr>
<tr>
<td>GLYBURIDE (2.5MG)</td>
<td>TYPE II DIABETES (HYPERGLYCEMIA)</td>
</tr>
<tr>
<td>GLYCON (METFORMIN) (500MG)</td>
<td>TYPE II DIABETES (ORAL HYPOGLYCEMIC)</td>
</tr>
<tr>
<td>LOSARTAN (100MG)</td>
<td>HYPERTENSION</td>
</tr>
<tr>
<td>APO-PEN VK (PENICILLIN V) (300MG)</td>
<td>ANTIBIOTIC (FOR RENAL DYSFUNCTION SUSPICION FROM PRIOR HOSPITAL STAY – refer to Appendix C)</td>
</tr>
</tbody>
</table>
The patient’s ADLs consisted of weekly chair yoga with seniors in her religious community, knitting, watching television, cooking, and playing with her two young grandchildren. The patient was independent in all aspects until recently; this year she moved in with her son’s family in a new city and her driver’s license was replaced with a Handy Dart bus pass. The patient often found herself in a depressed state due to her lack of independence and the difficulty she faced with completing her cherished ADLs.

In the past, this patient partook in the West Coast College of Massage Therapy’s (WCCMT) Parkinson’s patient in-reach. At WCCMT the patient had their legs worked on to help with the pain and stiffness; they had positive results with this hands-on treatment. The patient could not recall when they terminated the treatments there but was sure it was well over a year prior to this case study period. The patient was not a part of any other PD treatment programs or trials and was only seeing her medical doctor for follow-ups for her overall health and PD progression.

Patient Desired Outcomes

When asked about their desired outcomes from these treatments, the patient mentioned that they wanted to walk more steadily; they were dependant on a cane for stability. The patient mentioned many aches and pains in the initial assessment (refer to Appendix D), but they wanted to focus on the achiness in the joints caused by the rigidity, especially in the lower limbs. They also wanted to get some muscular tension relief caused by the stiffness; this made them feel stuck.

Precautions and Contraindications

Like with any pathology, there are always precautions, and often contraindications, for treating a patient. For the purpose of this case study, the patient presented with multiple pathologies,
however many of the cautions overlapped. Rattray & Ludwig (2000) suggest that stimulation of the sympathetic nervous system (SNS), prolonged vigorous techniques, and being prone for extended periods of time could worsen the symptoms of PD. Since the patient was hypertensive, shorter segmental strokes were used in treatment and the patient was positioned in supine for majority of the treatment time. Although the patient had elevated blood pressure, once treatments were completed she also had a bout of orthostatic hypotension as she sat up on the treatment table; extra caution was taken in helping the patient sit up and stay seated for a few moments post-treatment. It is suggested to avoid areas that are sensitive to touch, but in the case of this patient the areas that had decreased or absent sensation needed to be treated more cautiously. For example, hydrotherapy and pressure modifications, such as shorter periods of deep moist heat, for areas with altered sensation were made.

**Treatment Plan**

The case study patient was treated in 5 weekly treatments with 6 assessments all done over a 6-week period. Each appointment was between 90 to 120 minutes and included a gait and postural assessment, both before and after each treatment. The initial assessment, to get baseline measurements, was done two days prior to the first treatment. Under each treatment description, detailed homecare and remedial exercises are explained. The homecare and exercises were not too aggressive and focused mainly on relief of stiff and achy joint symptoms as well as posture. Given the patient’s age and Parkinson’s disease progression, as well as her other health concerns, the mild to moderate treatments and homecare seemed rational. Each massage therapy appointment took place in Vancouver Career College’s Student RMT Clinic in Burnaby, British Columbia.
Treatment Goals

The treatment goals were set with the objective of proving or disproving the hypothesis. The treatment goals were to: improve festinating gait, decrease the hypertonicity and increase circulation in the calves (gastrocnemius and soleus muscles) bilaterally, increase overall joint nutrition and improve posture. From treatment 3 onwards the following goals were added: decrease hypertonicity in the biceps brachii muscle and stimulate both the triceps brachii and wrist extensors, bilaterally.

Baseline Assessment

The patient’s first visit to the clinic consisted of filling out multiple intake forms, consent to treat forms, and case study pertinent questionnaires (Refer to Appendix A, B, D, E & F). It is important to note that the patient was not able to fill out the paper work themselves due to shaky hands causing the writing to be illegible; the therapist wrote as the patient dictated. A baseline assessment was done on the first visit as well. This consisted of all the special tests and postural scanning; all testing was done bilaterally. See Table 4 for the results of each test administered and Figures 5a-b for the initial postural scan.
### Table 4 – Special Tests Baseline Results

<table>
<thead>
<tr>
<th>Special Test</th>
<th>Baseline Results</th>
</tr>
</thead>
<tbody>
<tr>
<td>Active ROM (Glenohumeral (GH), elbow, wrist, fingers)</td>
<td>Limited in all joints in all planes of motion GH: most limited in Abduction (ABD) Wrist: most limited in extension</td>
</tr>
<tr>
<td>Passive ROM (GH, elbow, wrist, fingers)</td>
<td>A stuck feeling to start with in all ROM but once rigidity subsided full ROM was achieved in all planes in all addressed joints; no abnormal end feels</td>
</tr>
<tr>
<td>Dermatomes (C3-T2, L1-S1)</td>
<td>Patient could not differentiate dull vs sharp at any level</td>
</tr>
<tr>
<td>Myotomes (C4, C5, C6)</td>
<td>All graded 5/5</td>
</tr>
<tr>
<td>Deep Tendon Reflexes (DTR) (C5, C6, C7, L3/4)</td>
<td>C5-C7: Grade 0/5 bilaterally L3/L4: opposite side triggered when testing left side; 0/5 when testing right side.</td>
</tr>
<tr>
<td>Babinski Sign</td>
<td>Negative</td>
</tr>
<tr>
<td>Palmomental Reflex</td>
<td>Positive</td>
</tr>
<tr>
<td>Dexterity Test</td>
<td>Negative</td>
</tr>
<tr>
<td>Figure-8 Test</td>
<td>Positive</td>
</tr>
<tr>
<td>Heel to knee test</td>
<td>Negative</td>
</tr>
<tr>
<td>Patting Test</td>
<td>Negative</td>
</tr>
<tr>
<td>Pronation-Supination Test</td>
<td>Negative</td>
</tr>
<tr>
<td>Position Sense Testing (hands and feet)</td>
<td>Negative</td>
</tr>
<tr>
<td>Romberg’s Test</td>
<td>Negative (patient jittery at all times)</td>
</tr>
<tr>
<td>Respiration Measure at 3 locations (axilla, nipple line &amp; xyphoid process)</td>
<td>Axilla: ½” Nipple line: ½” Xyphoid process: 1”</td>
</tr>
<tr>
<td>Percussions</td>
<td>Normal</td>
</tr>
<tr>
<td>Machine to measure Inhalation (Triflo II)</td>
<td>1 of 3 balls raised</td>
</tr>
<tr>
<td>Ticking Watch test</td>
<td>Negative</td>
</tr>
<tr>
<td>W-test (for piriformis)</td>
<td>Left side = tighter (done in 1st treatment)</td>
</tr>
<tr>
<td>Reverse Phalen’s</td>
<td>Positive</td>
</tr>
<tr>
<td>Phalen’s</td>
<td>Positive</td>
</tr>
<tr>
<td>Tinel’s on Median Nerve (at carpal tunnel)</td>
<td>Negative</td>
</tr>
</tbody>
</table>
On September 10th, 2014, the patient received their first treatment to help decrease the signs and symptoms of PD. Before the treatment began, a postural scan and gait analysis were measured; note that this treatment consisted of the baseline assessment for gait analysis. The treatment began with the patient in the prone position, a bolster under the ankles, two cervical pillows used
for shoulder support, and the patient’s hands either comfortably placed on the table’s hanging arm rest below the face cradle or on the patient’s side resting on the table. In this treatment there was no music playing, the lights were on the dimmest setting and the patient was draped with a flannel sheet and fleece blanket.

The treatment started with effleurage to warm up the tissues and then a hydrocollator (the deep moist heat) was placed on the patient’s cervical area, thoracic area, lumbar area, gluteal area, and on the limbs for 5-7 minutes in each location prior to it being treated manually. PROM was done at all major joints in all directions. Then the ROOD’s techniques were administered, predominantly inhibitory ones in this treatment; prolonged stretch, slow stroking and neutral warmth (Refer to Appendix G for detailed instructions on ROOD’s techniques). The prolonged passive stretch was done for the gluteal muscles, hamstrings, quadriceps, gastrocnemius and middle trapezius. The only stimulatory ROOD’s technique was mild tractions at each of the major joints. A cycle was repeated so that PROM was done three times and the ROOD’s techniques were done twice, starting and finishing with PROM. All techniques were done bilaterally. The treatment ended with full body effleurage to flush out the system. The patient was in the prone position for approximately one hour and then in a supine position for an additional hour. In the supine position the patient was pillowed under the head and neck and a bolster under the knees. Due to the flexor pattern that was present in the patient’s limbs, the goal was to keep the patient supine without a support under the knees for as long as possible. Upon request, a bolster was placed under the knees each treatment for the patient’s comfort.
The treatment was completed with follow-up postural scans and gait analysis. See Figures 6a-b for postural scans from before and after the first treatment. Refer to Table 5 in the Results section to see the patient’s stride length before and after each treatment. No homecare was administered this visit so that the sole effects of the treatment could be measured in the following treatment. Refer to Appendix H for the clinical notes (SOAP notes) from this treatment; note that visit #2 corresponds to the first treatment for this case study.

*Figure 6a* Lateral View of Plumb Line (Before First Treatment)

*Figure 6b* Lateral View of Plumb Line (After First Treatment)
Treatment #2

On September 15th, 2014, the patient received their second treatment to help decrease the signs and symptoms of PD. Before the treatment began, a postural scan and gait analysis were measured. The treatment began with the patient in the prone position, a bolster under the ankles, two cervical pillows used for shoulder support, and the patient’s hands either comfortably placed on the table’s hanging arm rest below the face cradle or on the patient’s side resting on the table. In this treatment there was classical Indian music playing (for patient’s pleasure), the lights were on the dimmest setting and the patient was draped with a flannel sheet and fleece blanket.

Prior to the start of this treatment the patient’s vitals were taken, blood pressure (BP) read 150/90mmHg and heart rate (HR) was 80 beats per minute (bpm). A sample of the patient’s handwriting was taken before the treatment commenced; see Figure 12 in the Results section. The treatment started with effleurage to warm up the tissues and then a hydrocollator (the deep moist heat) was placed on the patient’s cervical area, thoracic area, lumbar area, gluteal area, and on the limbs for 5-7 minutes in each location prior to it being treated manually. PROM was done at all major joints in all directions. Then the inhibitory ROOD’s techniques were administered to all the hypertoned muscles; prolonged stretch, slow stroking and neutral warmth. The prolonged passive stretch was done for the gluteal muscles, hamstrings, quadriceps, gastrocnemius, middle trapezius and hip abductor muscles as a group. Tapping with PROM was done on the triceps and the forearm extensor muscles and compression with extension was done to the extensors of the forearm as well as the finger extensors, all to stimulate these muscles. Mild tractions at each of the major joints were also done. A cycle was repeated so that PROM was done three times and the ROOD’s techniques were done twice, starting and finishing with PROM. All techniques were
done bilaterally. The treatment ended with full body effleurage to flush out the system. The patient was in the prone position for approximately one hour and then in a supine position for an additional hour. In the supine position the patient was pillowed under the head and neck and a bolster under the knees. Due to the flexor pattern that was present in the patient’s limbs, the goal was to keep the patient supine without a support under the knees, but upon request it was placed under each treatment.

After the manual therapy portion of the treatment the patient had a paraffin wax hand treatment to help with the joint stiffness. The paraffin wax treatment is another form of DMH hydrotherapy. Post treatment the patient’s vitals were retaken, BP read 146/90mmHg and HR was 76 bpm. The patient refused to do another writing sample after the treatment; they had just had their medication and were too shaky. The treatment finished with follow-up postural scans and gait analysis. See Figures 7a-b for postural scans; notice blurry hands from tremor and stiff neck before treatment. Refer to Table 5 in the Results section to see the patient’s stride length before and after each treatment.

The homecare after the second treatment was to apply a tolerable temperature of heat to the quadriceps, hamstrings and forearm flexor muscles twice a day in 15 minute intervals. Refer to Appendix H for the SOAP notes from this treatment; note that visit #3 corresponds to the second treatment for this case study.
Figure 7a Lateral View of Plumb Line (Before Second Treatment)

Figure 7b Lateral View of Plumb Line (After Second Treatment)
Treatment #3

On September 22nd, 2014, the patient received their third treatment to help decrease the signs and symptoms of PD. Before the treatment began, a postural scan and gait analysis were measured. The treatment began with the patient in the prone position, a bolster under the ankles, two cervical pillows used for shoulder support, and the patient’s hands either comfortably placed on the table’s hanging arm rest below the face cradle or on the patient’s side resting on the table. In this treatment there was classical Indian music playing (patient responded well the previous treatment), the lights were on the dimmest setting and the patient was draped with a flannel sheet and fleece blanket.

Prior to the start of this treatment the patient’s vitals were taken, BP read 130/70mmHg and HR was 72 bpm. A sample of the patient’s handwriting was taken before the treatment commenced; see Figure 12 in the Results section. The treatment started with effleurage to warm up the tissues and then a hydrocollator (the deep moist heat) was placed on the patient’s cervical area, thoracic area, lumbar area, gluteal area, and on the limbs for 5-7 minutes in each location prior to it being treated manually. PROM was done at all major joints in all directions. Then the inhibitory ROOD’s techniques were administered to all the hypertoned muscles; prolonged stretch, slow stroking and neutral warmth. The prolonged passive stretch was done for the gluteal muscles, hamstrings, quadriceps, gastrocnemius, middle trapezius and hip abductor muscles as a group. Tapping with PROM was done on the triceps and the forearm extensor muscles and compression with extension was done to the extensors of the forearm as well as the finger extensors, all to stimulate these muscles. Mild tractions at each of the major joints were also done. A cycle was repeated so that PROM was done three times and the ROOD’s techniques were done twice,
starting and finishing with PROM. All techniques were done bilaterally. The treatment ended with full body effleurage to flush out the system. The patient was in the prone position for approximately one hour and then in a supine position for an additional hour. In the supine position the patient was pillowed under the head and neck and a bolster under the knees. Due to the flexor pattern that was present in the patient’s limbs, the goal was to keep the patient supine without a support under the knees, but upon request one was placed each treatment.

After the manual therapy portion of the treatment the patient had a paraffin wax hand treatment to help with the joint stiffness. Post treatment the patient’s vitals were retaken, BP read 132/74 mmHg and HR was 64 bpm. The treatment finished with follow-up postural scans and gait analysis. See Figures 8a-b for postural scans from before and after the third treatment. Refer to Table 5 in the Results section to see the patient’s stride length before and after each treatment.

The homecare after the third treatment was to continue applying a tolerable temperature of heat to the quadriceps, hamstrings and forearm flexor muscles twice a day in 15 minute intervals. The patient presented with anterior thigh and knee pain this treatment so they were given the option of using an ice pack on the quadriceps muscles for 15 minutes as needed. After this treatment the patient was given some postural exercises that were described by Rattray & Ludwig (2000) twice a day, at a pain-free intensity, in a set of 5 times per side; see Figure 9a-b. Refer to Appendix H for the SOAP notes from this treatment; note that visit #4 corresponds to the third treatment for this case study.
Figure 8a Lateral View of Plumb Line (Before Third Treatment)

Figure 8b Lateral View of Plumb Line (After Third Treatment)
**Part 1:** The head rotates in one direction while the legs (with the knees flexed) rotate in the opposite direction.

**Part 2:** Ninety degrees of shoulder abduction, 90 degrees of elbow flexion. One shoulder internally rotates while the other externally rotates. These are performed alternately in a slow rhythmic manner. The legs are not involved.

**Part 3:** The above actions are combined in a smooth relaxed manner.

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**Figure 9a** – Homecare Postural Exercises (Truncal Rotation)
(Rattray & Ludwig, 2000)

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**Part 1:** In sidelying, the trunk is slowly rotated forward and back with the hips relatively stable.

**Part 2:** The shoulder is retracted when the trunk is rotated back. The shoulder is protracted when the trunk is rotated forward (the extended arm reaches forward).

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**Figure 9b** – Homecare Postural Exercises (Spine and Shoulder Girdle Mobilization in Sidelying)
(Rattray & Ludwig, 2000)
Treatment #4

On October 6th, 2014, the patient received their fourth treatment to help decrease the signs and symptoms of PD. There was a two-week gap in the treatment schedule as the patient was sick the week prior and had to cancel their appointment. Before the treatment began, a postural scan and gait analysis were measured. The treatment began with the patient in the prone position, a bolster under the ankles, two cervical pillows used for shoulder support, and the patient’s hands either comfortably placed on the table’s hanging arm rest below the face cradle or on the patient’s side resting on the table. In this treatment there was classical Indian music playing (patient responded well the previous treatments), the lights were on the dimmest setting and the patient was draped with a flannel sheet and fleece blanket.

The treatment started with effleurage to warm up the tissues and then a hydrocollator (the deep moist heat) was placed on the patient’s cervical area, thoracic area, lumbar area, gluteal area, and on the limbs for 5-7 minutes in each location prior to it being treated manually. PROM was done at all major joints in all directions. Then the inhibitory ROOD’s techniques were administered to all the hypertoned muscles; prolonged stretch, slow stroking and neutral warmth. The prolonged passive stretch was done for the gluteal muscles, hamstrings, quadriceps, gastrocnemius, middle trapezius and hip abductor muscles as a group. Tapping with PROM was done on the triceps and the forearm extensor muscles and compression with extension was done to the extensors of the forearm as well as the finger extensors, all to stimulate these muscles. Mild tractions at each of the major joints were also done. A cycle was repeated so that PROM was done three times and the ROOD’s techniques were done twice, starting and finishing with PROM. All techniques were done bilaterally. The treatment ended with full body effleurage to flush out the system. The
patient was in the prone position for approximately one hour and then in a supine position for an additional hour. In the supine position the patient was pillowed under the head and neck and a bolster under the knees. Due to the flexor pattern that was present in the patient’s limbs, the goal was to keep the patient supine without a support under the knees, but upon request one was placed each treatment. No paraffin wax treatment was done in this session. The treatment finished with follow-up postural scans and gait analysis. See Figures 10a-b for postural scans from before and after the fourth treatment. Refer to Table 5 in the Results section to see the patient’s stride length before and after each treatment.

The homecare after the fourth treatment was to continue applying a tolerable temperature of heat to the quadriceps, hamstrings and forearm flexor muscles twice a day in 15 minute intervals. The patient was instructed to continue with the postural exercises that were described by Rattray & Ludwig (2000) twice a day, at a pain-free intensity, in a set of 5 times per side; see Figure 9a-b. Refer to Appendix H for the SOAP notes from this treatment; note that visit #5 corresponds to the fourth treatment for this case study.
Figure 10a Lateral View of Plumb Line
(BEFORE FOURTH TREATMENT)

Figure 10b Lateral View of Plumb Line
(AFTER FOURTH TREATMENT)
Treatment #5

On October 17th, 2014, the patient received their fifth and final treatment to help decrease the signs and symptoms of PD. Before the treatment began, a postural scan and gait analysis were measured, as well as a full reassessment, mimicking that of the initial visit (refer to Table 6 in the Results section). The treatment began with the patient in the prone position, a bolster under the ankles, two cervical pillows used for shoulder support, and the patient’s hands either comfortably placed on the table’s hanging arm rest below the face cradle or on the patient’s side resting on the table. In this treatment there was classical Indian music playing (patient responded well the previous treatments), the lights were on the dimmest setting and the patient was draped with a flannel sheet and fleece blanket.

Prior to the treatment a sample of the patient’s handwriting was taken; see Figure 12. The treatment started with effleurage to warm up the tissues and then a hydrocollator (the deep moist heat) was placed on the patient’s cervical area, thoracic area, lumbar area, gluteal area, and on the limbs for 5-7 minutes in each location prior to it being treated manually. PROM was done at all major joints in all directions. Then the ROOD’s techniques were administered, only the inhibitory ones in this treatment; prolonged stretch, slow stroking and neutral warmth. The prolonged passive stretch was done for the gluteal muscles, hamstrings, quadriceps, gastrocnemius and middle trapezius. A cycle was repeated so that PROM was done three times and the ROOD’s techniques were done twice, starting and finishing with PROM. All techniques were done bilaterally.
The treatment ended with full body effleurage to flush out the system. The patient was in the prone position for approximately one hour and then in a supine position for an additional hour. In the supine position the patient was pillowed under the head and neck and a bolster under the knees. Due to the flexor pattern that was present in the patient's limbs, the goal was to keep the patient supine without a support under the knees, but upon request one was placed each treatment. No paraffin wax treatment was done in this session. The treatment finished with follow-up postural scans and gait analysis. See Figures 11a-b for postural scans from before and after the fifth and final treatment. Refer to Table 5 in the Results section to see the patient's stride length before and after each treatment.

The homecare after the fifth treatment was to continue applying a tolerable temperature of heat to the quadriceps, hamstrings and forearm flexor muscles twice a day in 15 minute intervals. The patient was instructed to continue with the postural exercises that were described by Rattray & Ludwig (2000) twice a day, at a pain-free intensity, in a set of 5 times per side; see Figure 9a-b. Refer to Appendix H for the SOAP notes from this treatment; note that visit #6 corresponds to the fifth treatment for this case study.
Figure 11a Lateral View of Plumb Line (Before Final Treatment)

Figure 11b Lateral View of Plumb Line (After Final Treatment)
RESULTS

For the purpose of this case study an elderly female with long-standing PD was treated with manual therapy and hydrotherapy. They presented with frequent resting tremors, rigid movements, and a staggering gait. With 5 similarly structured massage treatments, the overall treatment goals were met. As seen in the images outlined in each treatment, the patient’s posture was more relaxed and up-right post treatments. The patient’s gait was very unsteady at the beginning of each treatment, but post treatment their stride length went from staggered to quite consistent. As can be seen in Table 5, the patient had consistency at the end of each treatment when it came to their stride length, but looking at the overall numbers, their stride was variable between treatments. Through the patient’s feedback, it became apparent that the treatments were decreasing their pain and increasing their comfort during the gait cycle.

The patient showed marked improvements in both the MSD-UPDRS and the PDQ-39 questionnaires; refer to Appendix E & F. Some big improvements noted were a decrease in fatigue during the day, more relaxed facial expressions, and an increase in their ability to perform ADLs, such as showering and dressing, more comfortably. When looking at the two questionnaires together, the results seem a little vague and almost skewed, as many questions overlapped but were answered differently in each document. Something that could have helped with getting more realistic scores on the questionnaires would have been ensuring that the patient was able to fill out the paperwork on their own rather than having to disclose their answers to the therapist who was writing the answers down as they dictated.
The patient’s muscles responded very well to heat, both in the treatments and at home between treatments. The patient said that the heat helped maintain their pain-free and smoother ROM in their major joints, especially in regards to their gait. In treatment, the patient relaxed so much that they fell asleep multiple times allowing their tremors to decrease; the patient arose feeling more rested. Like Vivas et al.’s (2011) study, this case study too found that both hydrotherapy and manual therapy assisted in decreasing the symptoms associated with PD.

The patient improved in many aspects of the special testing, including gaining sensation on the C4 and C5 dermatome pathways. The CTS tests were all negative in the reassessment, and the patient’s ability to take a full inhalation tripled from being able to raise 1 ball to 3 balls in the Triflo II machine; the patient did become more of an apical breather though. Refer to Table 6 for a full breakdown of the reassessment of special tests.

Although there is an extensive amount of research on PD, there is a lack of research about the effects of massage and hydrotherapy, together or separately, in regards to Parkinson’s. Future research needs to be done in relation to massage therapy and decreasing the symptoms associated with parkinsonian gait in order to even out and maintain a balanced and consistent gait as well as stride length. Further research needs to be done for respiratory enhancement and ease of joint pain in PD patients.

Table 5 – Stride Length Before & After Each Treatment

<table>
<thead>
<tr>
<th></th>
<th>FIRST TREATMENT</th>
<th>SECOND TREATMENT</th>
<th>THIRD TREATMENT</th>
<th>FOURTH TREATMENT</th>
<th>FIFTH TREATMENT</th>
</tr>
</thead>
<tbody>
<tr>
<td>BEFORE</td>
<td>15-20”</td>
<td>9-12”</td>
<td>15-19.5”</td>
<td>11-17”</td>
<td>15-20”</td>
</tr>
<tr>
<td>AFTER</td>
<td>~20”</td>
<td>~12”</td>
<td>23”</td>
<td>15-16”</td>
<td>16.5-17”</td>
</tr>
</tbody>
</table>
**Table 6 – Special Tests Final Assessment Results**

<table>
<thead>
<tr>
<th>Special Test</th>
<th>Final Assessment Results</th>
</tr>
</thead>
<tbody>
<tr>
<td>Active ROM (Glenohumeral (GH), elbow, wrist, fingers)</td>
<td>Limited in all joints in all planes of motion GH: most limited in Abduction (ABD) Wrist: most limited in extension</td>
</tr>
<tr>
<td>Passive ROM (GH, elbow, wrist, fingers)</td>
<td>Less of a stuck feeling to start with in all ROM and again when rigidity subsided full ROM was achieved in all planes in all addressed joints; no abnormal end feels</td>
</tr>
<tr>
<td>Dermatomes (C3-T2, L1-S1)</td>
<td>Patient could not differentiate dull vs sharp at any level except C4 and C5</td>
</tr>
<tr>
<td>Myotomes (C4, C5, C6)</td>
<td>All graded 5/5</td>
</tr>
<tr>
<td>Deep Tendon Reflexes (DTR) (C5, C6, C7, L3/4)</td>
<td>C5-C7: Grade 0/5 bilaterally L3/L4: opposite side triggered when testing left side; 0/5 when testing right side.</td>
</tr>
<tr>
<td>Babinski Sign</td>
<td>Negative</td>
</tr>
<tr>
<td>Palmpomental Reflex</td>
<td>Negative</td>
</tr>
<tr>
<td>Dexterity Test</td>
<td>Negative</td>
</tr>
<tr>
<td>Figure-8 Test</td>
<td>Positive</td>
</tr>
<tr>
<td>Heel to knee test</td>
<td>Negative</td>
</tr>
<tr>
<td>Patting Test</td>
<td>Negative</td>
</tr>
<tr>
<td>Pronation-Supination Test</td>
<td>Negative</td>
</tr>
<tr>
<td>Position Sense Testing (hands and feet)</td>
<td>Negative</td>
</tr>
<tr>
<td>Romberg’s Test</td>
<td>Negative (patient jittery at all times)</td>
</tr>
<tr>
<td>Respiration Measure at 3 locations (axilla, nipple line &amp; xyphoid process)</td>
<td>Axilla: 1” Nipple line: ½” Xyphoid process: 0”</td>
</tr>
<tr>
<td>Percussions</td>
<td>Normal</td>
</tr>
<tr>
<td>Machine to measure Inhalation (Triflo II)</td>
<td>3 of 3 balls raised</td>
</tr>
<tr>
<td>Ticking Watch test</td>
<td>Negative</td>
</tr>
<tr>
<td>W-test (for piriformis)</td>
<td>Left side = tighter</td>
</tr>
<tr>
<td>Reverse Phalen’s</td>
<td>Negative</td>
</tr>
<tr>
<td>Phalen’s</td>
<td>Negative</td>
</tr>
<tr>
<td>Tinel’s on Median Nerve (at carpal tunnel)</td>
<td>Negative</td>
</tr>
</tbody>
</table>
Study Limitations

The intent for the case study treatments was to have the patient come in for a 60-minute treatment bi-weekly for 5 weeks. Due to lack of patient compliance and them falling sick, the treatments took place in the fashion mentioned above; fewer, but longer, treatments over a slightly extended period of time. The patient always had short-term relief lasting for a few days, if the treatments were done bi-weekly, the patient may have experienced more long-term benefits.

A testing error was not doing specific muscle tests to assess the patient’s strength before and after treatments. Complete muscle tests, consisting of AROM, a 5 second break test and an
eccentric contraction, should have been completed for the Biceps Brachii, Triceps Brachii, Quadriceps Complex & Hamstrings Complex. Also, since AROM and PROM were assessed, Resisted ROM (RROM) to the GH, elbow, wrist and fingers should have been tested as well. Muscle tests and RROM would have made the assessment and reassessment more complete.

In future studies involving photography and/or videography, the patient should be instructed to wear the same clothing for each treatment. In order to capture consistent photographs and videos between sessions, the patient should be treated in the same room every time with the same background. Camera angles and distance should be measured and kept consistent from treatment to treatment.

**CONCLUSION**

Based on the results and the patient feedback, the hypothesis can be accepted as PROM, ROOD’s techniques, and deep moist heat did in fact decrease symptoms associated with Parkinson’s disease. Though the symptomatic relief was short-term, its impact on motor function helped the patient walk more steadily after each treatment, decreased their pain, as well as reduced the frequency and amplitude of their resting tremors. Overall, it was a safe and effective treatment for the patient and their condition, Parkinson’s disease.
REFERENCES


http://www.britannica.com/EBchecked/topic/380850/midbrain#refl114736


http://www.mayoclinic.org/diseases-conditions/parkinsons-disease/basics/treatment/con-20028488


http://www.parkinson.bc.ca/Parkinsons-Disease


http://www.medicalmnemonics.com/cgi-bin/return_browse.cfm?&discipline=Pathology&system=Nervous&browse=1