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CASE REPORT

An Evidence-based Practice for the Treatment of Lateral Medullary Syndrome

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This case report describes occupational therapy interventions focussed on improving the activities of daily living performance of a 73-year-old male recovering from Wallenberg syndrome, which resulted from a lateral medullary infarction. Historically, one of the most widely used approaches to physical rehabilitation in neurological populations has been the reflex-hierarchical theories, which are not supported in the literature as being effective for improving functional performance. Therefore, a contemporary task-oriented approach was used as a theoretical base for this case report. The Occupational Therapy Practice Framework was used to structure the occupational therapy evaluation, intervention, and outcome of this case.

KEY WORDS: Evidence-based practice • Lateral medullary syndrome • Task-oriented approach • Wallenberg syndrome

This case report describes the application of evidence-based occupational therapy interventions focussed on improving the activities of daily living performance of a 73-year-old male, who was recovering from Wallenberg syndrome. This syndrome resulted from a right lateral medullary infraction, which is a type of cerebral vascular accident (CVA). Historically, one of the most widely used approaches to physical rehabilitation in neurological populations has been the reflex-hierarchical theories, which are not supported in the evidence-based literature as being effective for improving functional performance (Horak, 1991). Therefore, a contemporary task-oriented approach (Mathiowetz, 2004; Mathiowetz & Bass Haugen, 1994) was used as a theoretical framework for this case report. In the task-oriented approach, Mathiowetz and Bass Haugen proposed that occupational performance emerges from the interaction of systems, including those related to the person and the environment. The dynamic system model is not unfamiliar to occupational therapists. Contemporary models such as the Person-Environment-Occupation model (Law et al., 1996) and the Person-Environment-Occupation-Performance model (Christiansen & Baum, 1991, 1997) both explore transactional relationships. The treatment in this case report focussed on helping the client to develop optimal strategies to function and to recognize task requirements and environmental demands that may support or hinder performance (Mathiowetz, 2004). To apply this approach efficiently, we have to first understand the concept of control parameters (Bass Haugen & Mathiowetz, 1995).

Control Parameters

According to Heriza (1991), a control parameter is a critical factor that can alter a person's behaviour pattern or performance.

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For example, attention can be a control parameter for clients with brain injury. Attention is a component of the cognitive system. The inability to attend to tasks can adversely affect the client's occupational performance. The challenge for the occupational therapist is to identify the control parameters that are crucial to function and are important to the clients. In the case of inattention, the client's performance may change drastically depending on the environmental distractions and the amount of information presented. If the treatment intervention only focuses on the sensorimotor system, the occupational therapist may not be able to help the client to reach his or her full potential.

In addition to the task-oriented approach, the Occupational Therapy Practice Framework (American Occupational Therapy Association [AOTA], 2008) was used to structure the occupational therapy evaluation, intervention, and outcome of this case.

Wallenberg Syndrome

Individuals who have sustained a CVA typically present with motor, sensory, cognitive, perceptual, speech and language impairments. The most classic manifestation of CVA is hemiparesis or hemiplegia, which results in mild weakness or complete paralysis on the side of the body opposite to the site of infarct. In addition, individuals may display motor planning deficits. These motor planning deficits impair the individual's ability to organize movement sequence required to perform daily living activities (Woodson, 1995). The patient's clinical presentation was atypical. He presented with sensory deficits affecting the trunk and extremities on the opposite side of the infarct, and with sensory and motor deficits affecting the face and cranial nerves on the same side of the infarct. He also presented with nystagmus, ataxia, and uncontrollable hiccups. Because the clinical presentation of the patient's stroke was not familiar, evidence-based practice was applied to ask background questions about his diagnosis of Wallenberg syndrome. According to Sackett, Rosenberg, Gray, Haynes, and Richardson (1996), evidence-based medicine (EBM) is "the conscientious, explicit and judicious use of current best evidence in making decisions about the care of individual patients" (p. 71). The practice of EBM integrates the clinician's expertise and the patient's value with the best available clinical evidence from systematic research (Guyatt & Rennie, 2004). Background questions are defined as questions asked for general knowledge about a condition (Straus, Richardson, Glasziou, & Haynes, 2005). What is lateral medullary syndrome? What are the clinical presentations? Lateral medullary syndrome is also called Wallenberg syndrome and posterior inferior cerebellar artery syndrome. It is characterized by sensory deficits affecting the trunk and extremities on the opposite side of the infarct, and by sensory and motor deficits affecting the face and cranial nerves on the same side of the infarct. Other clinical symptoms and findings are ataxia, facial pain, vertigo, nystagmus, Horner syndrome, diplopia, and dysphagia. The cause of this syndrome is usually the occlusion of the posterior inferior cerebellar artery at its origin (Kim, Lee, & Choi, 1998).

Client History

The patient received 20 days of acute rehabilitation, composed of at least 3 hours of therapy services daily, including occupational therapy, physical therapy, recreational therapy, and speech therapy. The patient is currently living in a single-family home with his wife. He is a civil engineer by training, but he owns and operates a property management company by trade. At age 73 years, he was working full-time, overseeing his business up until the onset of his CVA. The patient had a history of congestive heart failure and a long history of high blood pressure. He had been prescribed an angiotensin-converting enzyme inhibitor and a diuretic to control his blood pressure. He was well aware of the potential side effects and drug interactions of these medications.

Evaluation Findings

A top-down and client-centred approach was carried out as suggested by the AOTA (2008). The evaluation process was started by gathering information about the client's occupational profile, and by examining the client's occupational performance or "performance in areas of occupation" (AOTA, 2008, p. 630). Questions were asked about the patient's occupational history, interests, values, beliefs, needs, roles, and habits in the areas of basic activities of daily living (BADL), instrumental activities of daily living (IADL), education, work, play, leisure, and social participation. This information was gathered from the perspective of the patient and his family.

The Canadian Occupational Performance Measure

The Canadian Occupational Performance Measure (Law et al., 1991, 2005) was used to systemically collect information on the patient's occupational profile, therapeutic goals, and functional priorities. DeGrace (2003) stressed the importance for occupational therapy clinicians to involve the family in the clients' treatment planning and goal setting process. According to DeGrace, occupational therapy clinicians should focus on the meaningful aspects of family occupation and the construct of being a family. Intervention can be aimed at facilitating the

family's growth in their ability to participate in and to meet the occupational challenge of being a family. This focus can encourage the family to grow as a unit and develop more efficient, effective and satisfying ways of adapting to their occupational challenge of being a family. Therefore, the involvement of the patient's wife in the planning of treatment, choosing meaningful activities and interventions, and setting functional goals was paramount. The evaluation process was then followed by focusing attention to the occupations of concern through an analysis of occupational performance and underlying factors that influence performance.

Functional Independence and Assessment Measures

In this case, the occupations of concern for the patient were BADL, IADL, and work. Functional Independence Measure (FIM) (Granger, 1998) is a standardized measure consisting of 18 BADLs, cognition and social interaction items. The validity (Dodds, Martin, Stolov, & Dayo, 1993) and reliability (Ottenbacher, Hsu, Granger, & Fielder, 1996) of the FIM have been established and well-studied. In addition to the FIM, items from the Functional Assessment Measure (FAM) (Hall, 1997) were also included in the study. The FAM was developed as an adjunct to the FIM to specifically address the major functional areas that are relatively less emphasized in the FIM, including cognitive, behavioural, communication and community functioning measures. The FAM consists of 12 items. These items did not stand alone but were intended to be added to the 18 items of the FIM. The total 30-item scale combination was referred to as the FIM + FAM. The psychometric properties are reported to be valid and reliable (Hawley, Taylor, Hellawell, & Pentland, 1999). The data collected from observing the patient's performance in the FIM + FAM (Table) indicated that there were underlying factors that were influencing his performance. In this top-down approach, a Manual Muscle Test, for example, would occur preceding the observation of BADL, which reveals limited strength as an underlying control parameter to performance.

Stroke Impact Scale

In addition to the occupation-based assessment, the FIM + FAM, the Stroke Impact Scale, version 3.0 (Duncan, Lai, Bode, Perera, & DeRosa, 2003) was used to establish a base-line and to track the patient's functional process from his perspective. The Stroke Impact Scale 3.0 (SIS 3.0) is a stroke-specific, self-report, health status measure. It was designed to assess multidimensional stroke outcomes, including strength, hand function, BADL/IADL, mobility, communication, emotion, memory and thinking, and participation. The psychometric properties are reported to be valid, reliable, and sensitive to change (Duncan et al, 2003; Duncan, Wallace, Studenski, & Johnson, 2001; Granger, 1998). The patient rated 40/100 on the SIS 3.0 for the last question, "How much have you recovered from your stroke?"

The assessments showed that the sensorimotor system was the critical control parameter limiting the patient's occupational performance. The sensorimotor system includes strength, endurance, range of motion, coordination, sensory awareness, postural control, and perceptual skills (Mathiowetz & Bass

Table. The patient's Functional Independence Measure (FIM) + Functional Assessment Measure (FAM) gains after 4 weeks of treatment[a]

FIM items	Initial	Discharge	Gain	FAM items	Initial	Discharge	Gain
Eating	4	6	2	Swallowing	7	7	0
Grooming	4	6	2	Car transfer	4	6	2
Bathing	3	5	2	Community access	4	5	1
Dressing upper body	4	6	2	Reading	7	7	0
Dressing lower body	3	4	1	Writing	7	7	0
Toileting	4	6	2	Speech intelligibility	7	7	0
Bladder management	5	7	2	Emotional status	6	6	0
Bowel management	5	7	2	Adjust to limitations	5	6	1
Bed, chair, and wheelchair transfer	4	6	2	Employability	5	6	1
Toilet transfer	4	6	2	Orientation	7	7	0
Tub and shower transfer	1	5	4	Attention	7	7	0
Locomotion	4	5	1	Safety judgement	5	7	2
Stairs	2	5	3				
Comprehension	7	7	0				
Expression	7	7	0				
Social interaction	7	7	0				
Problem solving	7	7	0				
Memory	7	7	0				

[a]The FIM + FAM are a 30-item, seven-level ordinal scale, from 1-total assistance to 7-complete independence.

Haugen, 1994). As the number of joints involved in the tasks increased, the patient's functional control and coordination decreased. This phenomenon was termed the degrees of freedom (Bass Haugen & Mathiowetz, 1995).

Treatment Programme

The treatment programme was geared towards tackling the control parameter and matching the patient's degrees of freedom with the task and environmental demands. For example, the patient was taught to stabilize his forearm on the sink to compensate for his lack of coordination and proximal control during shaving. Once stabilized, he was able to shave independently using an electric razor. Treatments focused on task-oriented training in BADL incorporating environmental adaptation, adaptive equipment prescription, and motor retraining. The patient received 1 hour of occupational therapy intervention three times per week for 4 weeks. The patient's short-term goal was to continue to improve his efficiency and independence performing BADL. His long-term goal was to regain the ability to return to his office and work on a part-time basis. For this reason, treatment was initially directed towards self-care and functional mobility tasks and later towards anticipated work tasks and community mobility tasks.

The patient's left shoulder exhibited decreased muscle tone and was prone to develop subluxation (Louise & Anchalee, 2002). At this point, evidence-based practice was applied by asking a foreground question in an attempt to seek the best available evidence to treat the patient's shoulder. Foreground questions were defined as questions asked for specific knowledge to inform clinical decisions. PICO is a mnemonic used to describe the four elements of a good clinical foreground question. *P* stands for patient, *I* stands for intervention, *C* stands for comparison (as an optional component), and *O* stands for outcome. In this case, the following question was asked: "In patients with a flaccid shoulder post-stroke, is electrical stimulation effective in preventing shoulder subluxation?" After the foreground question was composed, PubMed, which is a free online database managed by the US National Library of Medicine and the National Institute of Health, was accessed to locate evidence to assist in clinical-decision making. According to EBM, there is a hierarchy of strength of evidence for treatment decisions. The strongest evidence is represented by a systematic review or meta-analysis of randomised trials, followed by individual randomized clinical trials, followed by systematic review of observational studies and unsystematic clinical observation (Guyatt & Rennie, 2004). To save time and resources, systematic reviews should be located prior to individual randomized clinical trials. The absence of evidence is not equal to negative evidence. The goal is to locate and incorporate the current best available evidence in making decisions about the care of the patients. According to the results of a meta-analysis, Louise and Anchalee (2002) reported that electrical stimulation prevented on average 6.5 mm of shoulder subluxation when added to conventional therapy. In addition, a more recent meta-analysis by Glinsky, Harvey, and Van Es (2007) concluded that electrical stimulation has a modest beneficial effect on improving muscle strength in patients with stroke. The current best available evidence supports the use of electrical stimulation early after stroke for the prevention of shoulder subluxation and for the facilitation of motor recovery. This evidence was presented to the primary care physician and he wrote the prescription without any hesitation. The next step was to present the meta-analysis to the patient and his wife. The potential benefit, adverse effects, and contraindications of neuromuscular electrical stimulation treatment were explained in laymen's terms. The patient and his wife agreed to proceed with this treatment modality. The patient's wife was trained to monitor skin integrity and the appearance of any persistent redness that may indicate electrical burns from the electrodes.

The overall intervention plan was to use adaptive occupation for the purpose of compensation and therapeutic occupation for the purpose of remediation. These two approaches can complement each other to maximize the support for participation. The results of two studies conducted by Wu, Trombly, Lin and Tickle-Degnen (1998, 2000) showed that the condition of object present or enriched object affordances elicited a better performance of movements represented by kinematic variables than the condition of object absent or impoverished object affordances. The clinical implication of the studies was that the use of real and functional objects and occupation-based activities were effective ways of facilitating efficient, smooth and coordinated movement of an impaired arm in persons with stroke (Wu et al., 1998, 2000). The appropriate selection of therapeutic occupation-based activities was the result of collaboration between the client and the occupational therapy clinician. For adaptive occupation, a consultation process was used to collaborate with the patient and his family to seek solutions in altering the activity demands during bathing activity to ensure safety and to improve efficiency. The patient was trained to use a shower chair and handheld showerhead to perform bathing activity. He was also trained to use a reacher for lower extremity dressing while seated to overcome his fear of falling. The patient and his wife were educated on secondary prevents and on recognizing warning signs and symptoms of stroke using the National Stroke Association's "Acting F.A.S.T." educational materials (www.stroke.org). For the purpose of remediation,

the therapeutic occupations used were BADL and IADL relevant to the patient's daily life, including community mobility, and physical and mental activities required for him to return to work in his office.

Results

The main outcome measures used were the same as that used in the evaluation process for consistency and comparability of results (Table). The patient met his goals in all of the areas of occupational performance, and he was able to return to work on a part-time basis. He was able to shave with an electric razor, get dressed independently, ambulate safely with a quad cane outdoors, and go to his office to attend to his business. He expressed his gratitude and was very satisfied with his ability to meet the demands of the roles that he engaged in. The patient and his family realized that the journey of recovery did not end here; however, they felt confident that they were equipped to conquer any challenges life might bring. He rated 85/100 on the SIS 3.0 for the question, "How much have you recovered from your stroke?"

Conclusion

Providing occupational therapy to the patient validates what was learned in the doctoral programme in occupational therapy. This case study illustrated the clinical reasoning and the utilization of therapeutic components in the occupational therapy practice framework and evidence-based practice. Instead of relying on preparatory methods, mechanistic interventions and reductionist approaches, practitioners are encouraged to use graded real-life activities that are purposeful and meaningful to the clients. The AOTA (2008) provides an invaluable guide to occupational therapy practice by providing clinicians with a structure to client-centred, family-centred and occupation-based practice in a systematic and logical way. The skills learnt in evidence-based practice can help the clinician to be more efficient and gain respect. The overarching statement, "…supporting health and participation in life through engagement in occupation" (AOTA, 2008, p. 626) reflects the essence of our profession and will continue to lead us into the future.

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