Geriatric Comprehensive Rehabilitation using Pressure Biofeedback of Neurogenic Bladder: A Case Report

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ABSTRACT
This case report examines the effectiveness of pressure biofeedback in managing neurogenic bladder in a geriatric patient. Neurogenic bladder, a prevalent issue in elderly individuals with neurological impairments, leads to symptoms such as urinary incontinence and retention, significantly impacting quality of life. Pressure biofeedback, a non-invasive rehabilitation approach, provides real-time feedback to enhance pelvic floor muscle control. This technique has shown promise in reducing urinary symptoms, lowering infection risks, and improving overall bladder function. The case highlights biofeedback as a viable alternative for elderly patients, promoting autonomy and functional improvement in bladder control without invasive procedures., transformation, and adaptation - this study is extremely important.

Introduction

Neurogenic bladder dysfunction, a condition commonly linkedto aging process and neurological disorders, significantly affect quality of life, particularlyin geriatric patients.[1] The disorder results from impaired neural pathways controlling bladder function, often resultingin symptoms such as urinary retention, incontinence and increased susceptibilityto urinary tract infections (UTIs).[1,2] This condition is common among elderly patients with conditions like stroke, spinal cord injury, or neurodegenerative diseases, with an estimated 45% prevalence among the elderly with neurological disorders.[3,4] Given the multifaceted needs of this demographic, a holistic, comprehensive and adaptable rehabilitation strategy is crucial.

Pressure biofeedback training is an innovative intervention in the rehabilitation of neurogenic bladder. By providing real-time feedback on pelvic floor muscle activity, pressure biofeedback facilitates patient awareness, control, and engagement in therapeutic exercises aimed at improving bladder function.[5] Studies have shown that biofeedback-assisted pelvic floor exercises can significantly reduce urinary incontinence episodes and improve bladder compliance in patients with neurogenic bladder.[5,6] This case report discusses a comprehensive rehabilitation strategy employing pressure biofeedback for an elderly patient with neurogenic bladder, addressing clinical outcomes and potential implications for geriatric care.

CaseReport

A Female, 73 years old, was referred to Physical Medicine and Rehabilitation due to neurogenic bladder.She complained urinary retention for 5 months, often wake up at night, and had to use a folley catheter to evacuate the urine. Thus, it affected her life satisfaction (EQ5D 55).

Urodynamics showed the detrusor was under activity and low bladder capacity. USG result revealed chronic cystitis with normal kidney, uterus and surrounding organ. She had difficulty in voiding, yet the pelvic floor muscle strength was poor. The vaginal muscle strength was 2 and anal sphincter strength was 3. Handling this patient complicated by Geriatric Giants, including immobility, impaction (constipation in the last 2 weeks), impotence (menopause), inanition (malnutrition), infection (hepatitis C), instability (need hold object when walking), with depression (GDS 10) and fear of fall (score 55), we perform pressure biofeedback using vaginal probe as diagnostic and therapeutic modality.

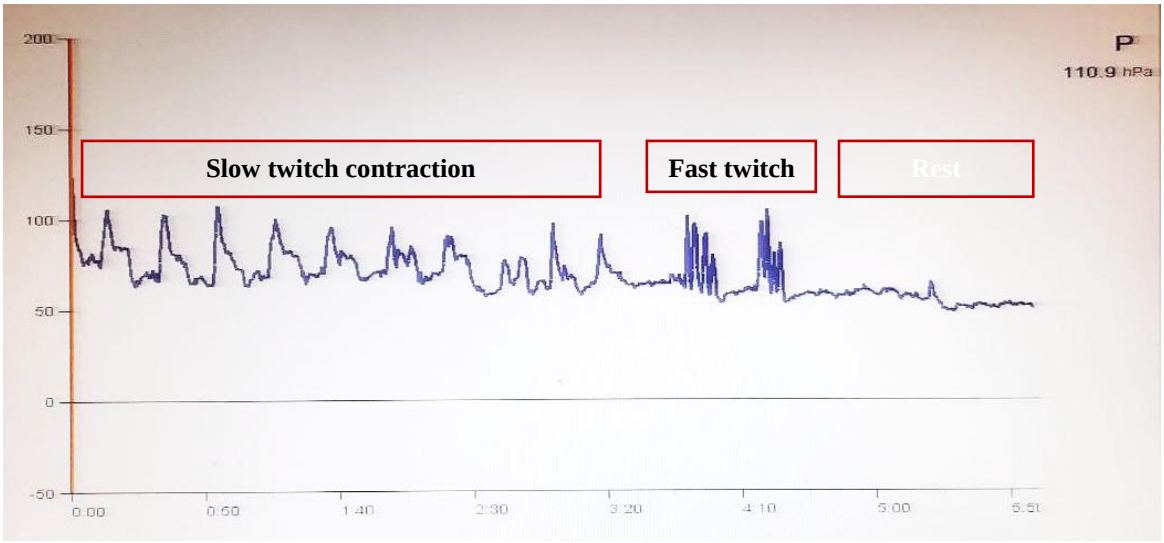

Figure 1.a Diagnostic Pressure Biofeedback

Figure 1.a showed the first pressure biofeedback diagnostic that revealed spasm in the pelvic floor muscles as indicated by an average baseline of vaginal muscle contraction when relax was 48 hPa (normal relaxation target is less than 20 hPa). The patient is incontinent due to the pelvic floor muscle contraction in fast or slow twitch were less 110 hPa (normal contraction was above 200 hPa). This result indicate the pelvic floor muscle contraction strength was still lacking. Pelvic floor muscle endurance was poor due to inability to maintain contraction strength, as can be seen the maximum contraction decreases over time in both fast twitch or slow twitch. We demonstrate the right technique of pelvic floor muscle contraction and relaxation using diaphragmatic breathing, anterior and posterior pelvic tilting. The second pressure biofeedback was recorded to evaluate whether she had properly contracted and relaxed the pelvic floor muscle exercise. She responded well to pelvic floor exercise, as the awareness of muscle contraction and relaxation improved, and the spasm decreased (Figure 1.b).

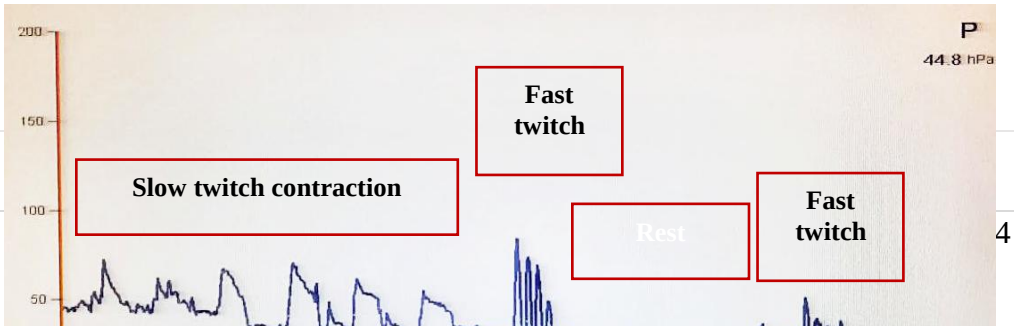

Figure 1.b. Therapeutic Pressure Biofeedback (immediate effect)

After comprehensive treatment and psychological support for 3 weeks, the catheter was able to be removed. She had great results of biofeedback evaluation four months later. The condition of the pelvic floor muscles spasm was improved as shown by a baseline average of below 20 hPa. Additionally, the strenght of pelvic floor muscle contractions strength enhanced, with average contractions exceeding 100 hPa. Muscle endurance was better as seen in the graph during slow twitch and fast twitch phases (Figure 2). The summary of the biofeedback result can be seen on Table1. The improvement in neurogenic bladder case using pressure biofeedback was accompanied by the improvement in all Geriatric Giants: GDS 6, fear of fall score 32, thereby increasing life satisfaction (EQ5D 75).

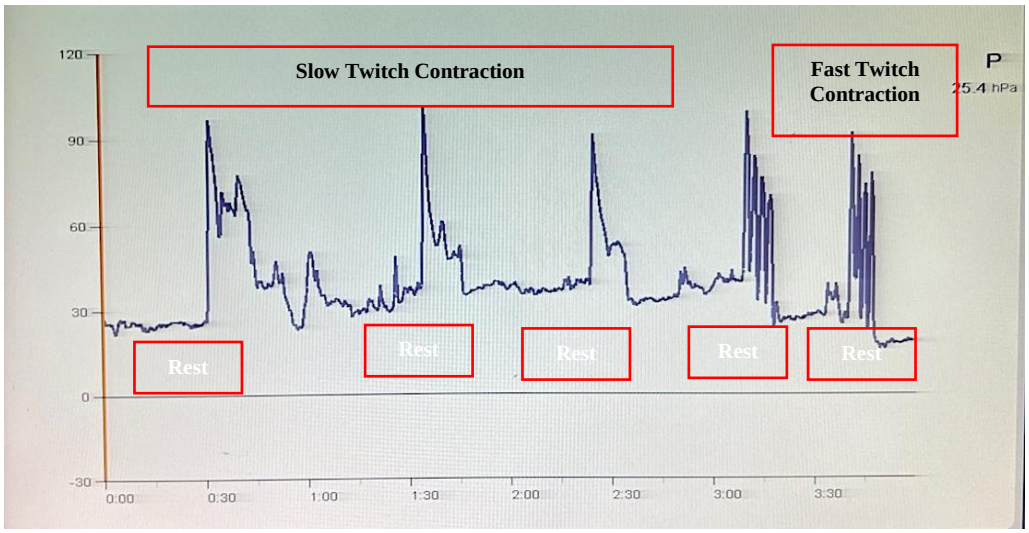

Figure 2. Therapeutic Pressure Biofeedback Evaluation (4 months after)

Table 1. Pressure Biofeedback Result: Diagnostic, Immediate Effect, and 4-Months after

Pressure Biofeedback	Diagnostic (hPa)	Therapeutic (hPa) (Immediate effect)	Therapeutic (hPa) (4 months after)
Minimum	48.0	15.9	15.6
Maximum	126.7	84.0	104.3
Delta	78.7	68.1	88.7

Average	68.7	35.8	39.0
Total Recording Time	6:00	6:00	4:00

Discussion

Urinary problem is one of the most common yet challenging case in geriatric patients[7]. Biological aging process in geriatric is linked to deterioration of cardiovascular, neuromuscular functions and several hormones stimulating muscle cell growth which leads to reduced ability to do daily tasks[8,9,10]. There is rapid decrease in muscle strength than muscle mass in elderly[11], including in pelvic floor muscle[12]. The usage of biofeedback may also be useful as diagnostic and therapeutic tool in optimizing pelvic floor muscle strength objectively[12,13]. Comprehensive geriatric assessment combined with multimodal rehabilitation is the key for satisfactory result.

The application of pressure biofeedback in the rehabilitation of neurogenic bladder among elderly patients offers promising outcomes[14].Urinary retention has different clinical conditions that can be seen with biofeedback, as illustrated in this case. This modality method demonstratedthat the urinary retention may be accompanied by weakness of the lower pelvic muscles, as well as being caused by muscle spasm which is the primary cause of urinary retention. This complicated neurogenic bladder problem certainly requires comprehensive treatment, not only focusing on lower pelvic muscle relaxation techniques, but also training the patient to have optimal lower pelvic muscles contraction to prevent further urinary incontinence.

Neurogenic bladder often challenges geriatric patients due to age-related muscle atrophy, decreased neural plasticity, and comorbid conditions[15]. Addressing this through biofeedback therapy, which enhances pelvic floor muscle control, aligns with evidence suggesting biofeedback is particularly effective in improving bladder control and reducing urinary symptoms in neurogenic cases[13].

Biofeedback's advantage lies in its capacity to offer immediate, tangible feedback, helping patients gain better awareness and coordination of their pelvic floor muscles[16]. For elderly patients, this feedback is especially valuable, as it can counter age-associated declines in proprioception and control[17]. Proprioception has an important role in the planning of precise, coordinated movements, and controlling body posture[18]. Burgio et al.study indicated that older adults who underwent biofeedback training showed a significant reduction in incontinence episodes, with improvements sustained over months[14]. This outcome supports biofeedback as an effective long-term strategy for managing neurogenic bladder, even in complex geriatric cases[19]. Additionally,a systematic review found that biofeedback could also reduce the reliance on catheterization by promoting functional bladder emptying[20], a key benefit for elderly patients who are particularly susceptible to UTIs[21].

Nevertheless, the utility of biofeedback may vary depending on patient adherence, cognitive status, and the severity of neurogenic bladder dysfunction. Incorporating cognitive assessments and patient-centered adaptations to the biofeedback protocol may further enhance outcomes, particularly for geriatric patients with cognitive decline[22]. Future research should investigate tailored biofeedback interventions for the elderly, integrating aspects like caregiver

involvement and simplified feedback interfaces. This case underscores the potential of biofeedback in neurogenic bladder rehabilitation, encouraging its broader application as a non-invasive, effective option for elderly patients.

Conclusion

Neurogenic bladder may worsen the patient condition with Geriatric Giants. Geriatric Comprehensive Rehabilitation using Pressure Biofeedback may significantly improve the symptoms and quality of life.

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