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CASE STUDY

AMBULATION ON TREADMILL AS A DIAGNOSTIC TOOL FOR PSYCHOGENIC GAIT DISORDERS - A CASE STUDY

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ABSTRACT

Background: Psychogenic gait disorders are a challenge for the medical professionals both in diagnosis and management because the signs and symptoms demonstrated by the patients are medically unexplainable. ***Objective:*** The objective of this case report is to introduce the scope of treadmill ambulation as a diagnosis in cases of psychogenic gait disorders. ***Methods:*** A patient was referred to physiotherapy OPD for gait training for her bizarre gait pattern. Quantitative and qualitative analysis of gait was done using GaitRite system as well as on treadmill. ***Results:*** We observed that when the patient was made to walk on the treadmill which was a novel task for the individual, there was a major change in the quality of gait to a normal alternate leg pattern. ***Conclusion:*** Treadmill ambulation for patients with gait deviations, for whom the disorders are medically unexplainable, will help in early diagnosis of psychogenic gait disorders.

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INTRODUCTION

Psychogenic Movement Disorders (PMD) are a set of conditions seen in patients who are referred to neurology clinics which lacks explanation in medical grounds. It has been identified that 16% of movement disorders fall under PMD. As the disorder is medically unexplainable, they are also termed as 'Crisis for Neurology' (Edwards and Bhatia, 2012). Several historical and physical examination findings are noted in these patients, but they can be rarely used as a diagnostic criteria. This is because the presenting symptom is mostly individualistic and varies within individuals. Common findings include rapid progression, variability in symptoms and complete remission and sudden recurrences. Rapid progression of movement disorders are very unlikely in neurological illness and thus stands to be a major criteria pointing out towards PMD. According to Thomson *et al.* (1988) the investigations must be kept to a minimum and must be stopped once PMD is suspected. This helps in reducing the financial burden left on the patient as well as helps the clinician gain time and energy to view the presenting symptoms in a different perspective. They emphasis the role of paramedical staff in the diagnosis of PMD as they spend major share of time with the patients. In most of the cases discussed in their paper, physiotherapists detected inconsistencies in the patient's claimed power deficits. Psychiatric assessment must be done alongside to confirm the diagnosis along with cognitive functional therapy and a planned programme of physical activity. The objective of this case study is to provide an insight to a different perspective that can be used to identify psychogenic gait disorders. In this case study, we discuss about a female patient of age 29, who was referred by the neurologist to Physiotherapy OPD of NIMHANS Bengaluru for gait training for her gait disturbances. Patient hails from Narajole district of West Bengal, and was accompanied by her husband and daughter of 2 years old. The history revealed a progressive weakness of right lower limb at the age of four, after which she developed limping gait. No treatment was provided to her at that time or afterwards. She hasn't underwent any surgeries and neither have any associated problems.

METHODS

Examining the patient revealed no weakness of the major muscle groups except for right quadriceps with grade 4-. The muscle tone was normal and ROM was within normal limits for all the joints. She had a mild scoliotic posture towards the left, with distance between tip of middle finger to floor at erect standing on the left side and right side being 55cm and 58cm respectively. She had a difference in apparent leg length between left and right leg with 86cm and 88cm respectively. The true limb length was 80cm bilaterally. Examination

revealed no other relevant musculoskeletal or neurological deficits.

Observational gait analysis: Observational gait analysis revealed a bizarre gait pattern with left leg leading the propulsion of body and right leg taken towards the left leg, ending with contact to each other. Body tend to propel sideways to the left and not in a straight line. Right leg tends to stay always behind the left leg, and feels as if the right leg is being dragged towards the left leg during ambulation. Heel off is present in left leg, but foot is placed without a heel strike on both legs after the swing phase. Knee flexion is near normal on the left leg during initial swing, but right leg shows a minimal flexion as it starts its trajectory forwards towards the left leg. The swing phase of both legs are compromised and a larger stance phase is evident during observation. Although the patient finds it comfortable to walk in this odd pattern, the quality of gait was poor. This had also created an impact on her family and their social interactions and thus was forced to seek medical attention.

Gait analysis using gait rite: Quantitative Gait Analysis was done using Gait Rite Assessment System, which is a high end device, which provides all the necessary parameters of gait as the patient is made to walk over the sensor-fixed mat (Video Legend 1). Patient consent was obtained for video recording her gait and to use the assessment data for research purposes. The distance covered on the mat was 232cm, with a velocity of 59.8cm/sec and cycle time of 0.01 sec. The cadence rate was 139.2 steps/min with step time of 0.41 sec for left and 0.44 sec for right. Step length of left and right were 51.16 and 5.47 cm respectively. Single support of left and right were 40% and 0.9% of gait cycle respectively, with swing being 0.9% of gait cycle for left and 40.6% of gait cycle for right leg. Double support of left and right were 60.8% and 58.5% of gait cycle for left and right leg respectively with stance % of 99.1 and 59.5% for left and right leg. Degree of toe out of left leg was 7^0 whereas right leg had only 1^0 of toe out. Functional Ambulation Profile score when assessed gait using Gait Rite was 65. We hypothesized that the bizarre walking pattern demonstrated by the patient can be converted to a normal walking pattern if the patient is made to deviate her conscious thoughts from her gait. Thus a novel walking instrument such as the treadmill was introduced to the patient, which will reduce the chances of manipulating the gait by the patient, thus may be able to achieve a better quality of ambulation (Video Legend 2).

Gait analysis using treadmill: In our observation, treadmill ambulation helped patient to achieve a near normal walking pattern with a rhythmic alternate placement of right and left leg. Both legs demonstrated heel off and a minimal heel strike at the end of swing phase. Hip and knee flexion was adequate for both the legs which can be considered normal for the speed set on the treadmill. Patient was comfortable in walking on treadmill and had a feeling of walking normal. The quantitative analysis done with the treadmill sensors provided the following values; patient was made to walk for two minutes and thus covered 20 m. The average speed was displayed as 17 cm/s. Average step cycle was 0.09 cycles/second. Average step length for left leg was 58 cm and right leg was 46 cm. Right-left time distribution was 39% and 61% respectively. The ambulation Index as identified by treadmill ambulation was 36. Video recordings done along with treadmill ambulation was also utilized to educate the patient about the changes attained with treadmill walking and the possibility of change in quality of walking with appropriate interventions.

DISCUSSION

Treadmill is a very useful equipment used in most of the physiotherapy setups, for gait assessment and training. It has been a common machinery which is being in use and is available readily. Treadmill, which is a common gait training equipment in all physiotherapy set up, is a novel equipment for walking for majority of patients referred to physiotherapy. Initial use of treadmill for ambulation helps in distracting those with Psychogenic Gait Disorders (PGD) as they focus more on walking on the same with caution and safety. In our findings, walking on treadmill changed the pattern on walking of our patient, and she attained an almost normal walking pattern with right leg moving ahead of left leg after the swing phase. Lempert *et al.* (1991) have documented six characteristic features which are proved to be most valuable for diagnosis of PGD, which can be seen alone or in combination in 97% of cases. These include 1) momentary fluctuations of stance and gait, often in response to suggestion; 2) excessive slowness or hesitation of locomotion incompatible with neurological disease; 3) "psychogenic" Romberg test with a build-up of sway amplitudes after a silent latency or with improvement by distraction; 4) uneconomic postures with wastage of muscular energy; 5) the "walking on ice" gait pattern, which is characterized by small cautious steps with fixed ankle joints; 6) sudden buckling of the knees, usually without falls. Ambulation on treadmill have found to improve the gait of patient, both in quantitatively and qualitatively. The changes in gat parameters can be attributed to the distraction given to the patient when she was made to walk on a novel machinery and also the voluntary effort taken to correct the pattern to safeguard from falling. We had also made the patient to walk over a mat highlighted with footprints and asked to place her foot over the highlighted marks. It was found that as the patient consciousness was taken to have accurate foot placement, the quality of gait was also improved drastically. This led to a hypothesis of having gait training using visual cues, thus inducing a new motor programme within themselves.

Marcelo Marello *et al.* (2012) have explained that the diagnosis of PGD mainly depends on observation of bizarre motor behaviour, discrepancy between obvious dysfunction and normal diagnostic evaluation, and evidence of psychiatric abnormalities. He pointed out that patients with PGD fail to maintain the same gait pattern after repeated evaluations, which represent an important finding for PGD diagnosis. Anika Aakeroy *et al.* (2012) have also described the effectiveness of video recording in the diagnosis of PGD. Ambulation on treadmill for a confirmatory diagnosis of PGD have not been documented elsewhere. We conclude that treadmill ambulation for patients with gait deviations, for whom the disorders are medically unexplainable, will help in early diagnosis of psychogenic gait disorders. As treadmill is a common equipment used in almost all the physiotherapy setups, using treadmill as a diagnostic tool helps in arriving at diagnosis and thus avoid unwanted investigations and procedures. This also helps in guiding the patient to the right clinician for psychiatric evaluation and further proceedings. We also emphasis the role of treadmill ambulation in the rehabilitation of these patients, along with cognitive functional therapy and planned physical activities. Interventions must also utilize feedback training and conscious effort of the patient to

change the quality of their walking pattern to effectively deal with this challenging condition. This will also help in improving their quality of life both within themselves and within the community they live in.The limitation of this study was a lack of follow-up gait assessments as the patient was not available for the same.

Conflict of Interest: The authors have declared no conflict of interest.

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Ethical compliance statement: The authors confirm that the approval of an institutional review board was not required for this work because no interventions was provided to the patient as part of the study. Informed consent was obtained from the patient and have attached with this manuscript. We confirm that we have read the Journal's position on issues involved in ethical publication and affirm that this work is consistent with those guidelines.

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