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Analysis of Gait Pattern Affected by Various Disease : A Review

Nikita Ranjit Birambole, Pratima Salunkhe
Department of Forensic Science, Yashwantrao Chavan Institute of Science, Satara, Maharashtra, India

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ABSTRACT

Gait is pattern of walking of individual, is unique pattern of a person. The gait pattern is affected by various disease, ill condition of a person. In this review article we discuss about various diseases by which gait of an individual gets affected. Some disease are ; Parkinson's disease (PD) is a degenerative brain disorder causing shuffled gait, impaired balance, and freezing of gait. Morquio A syndrome, a group of disorders called mucopolysaccharidosis, can lead to vision, hearing, bone, brain, and heart problems. The anterior cruciate ligament (ACL) is a key stabilizer in the knee, and a torn ACL can cause instability when walking or changing directions. Examination of the gait pattern of a those person who having a disease such as ; Parkinson's disease, Morquio A syndrome, Anterior Crucial Ligament, etc. In normal human the Gait Cycle has two phases ; Stance and swing phase. The stance phase covers approx 60% gait cycle and swing phase covers remaining 40% of gait cycle. In further studies we can analysis on how this cycle varies in abnormal walking.These review article summarises about gait pattern affected by various diseases. Study of gait pattern used for solving criminal cases as we can recognize various abnormalities a person may have by the analysis of his or her gait pattern. It is used as secondary evidence. By using gait pattern we can find out individuals age, sex, and height.

Keywords: Gait Pattern, Gait Abnormalities, Parkinson's Disease, Marquio A Syndrome, ACL.

I. INTRODUCTION

Gait is the movement of human limbs during characteristic. It is used to detect abnormalities in walking patterns, which can be due to medical conditions or injury. In these paper we discussed about various disease which affects the gait pattern. Such as, Parkinson's , marquio A syndrome, Arthrogryposis multiplex congenita (locomotion over a plane surface, a biological AMC), Anterior crucial ligaments (ACL), etc. Parkinson is affects the central nervous system and the brain nerve cell get damaged, it results in loss of dopamine. When in body level of dopamine decreases it causes uneven brain activity. It

is arise at age of 65 year. Parkinsonism is a condition characterized by tremor, rigidity, postural instability, and decreased spontaneous movement. Diagnosis is easier when a full clinical picture is present, but early stages may show fragments. Patients have a flexion posture, immobile face, and restricted trunk rotation, leading to a propellent gait and reduced angular excursion.(Howard Lee, 2008) Morquio A syndrome is a progressive condition characterized by musculoskeletal symptoms such as short stature, spine abnormalities, hip dysplasia, joint laxity, and abnormal gait. Patients often need various orthopedic interventions to stop distortion and improve function. Spinal involvement can lead to neurological injury and premature death. The syndrome also affects mobility, with many patients using walking aids or wheelchairs. Non-skeletal manifestations contribute to morbidity and mortality. (Klane k .white, 2014) Arthrogryposis multiplex congenita (AMC) is a complex condition characterized by deformed joints with intact sensory systems, with amyoplasia being the most common subtype. AMC can be classified into limb involvement disorders, organ involvement disorders, and central nervous dysfunction disorders. Children with AMC's mobility depends on joint range of motion, with knee joint involvement being 70%. Hip deformities and foot deformities are common. (Bartonek, 2015) Parkinson's disease (PD) is a progressive degeneration of the nigrostriatal system, causing motor impairments. PET and SPECT imaging visualize dopaminergic system functionality, with compensatory changes primarily in the hemisphere. (Elena Kordys, 2017) End-stage hip arthritis treatment in young or active patients requires revision due to improved life expectancy. Shorter femoral stems are proposed for total hip arthroplasty (THA) due to their ability to load proximal metaphyseal bone, improve implant fxation and osseointegration, reduce bone loss, and lower mid-thigh pain incidence. Short stems may also be protective against periprosthetic fractures. (Anatole V.Wiik, 2018) Disease and aging are the main causes of reduced gait function, with stroke being a common cause. Stroke patients experience decreased gait speed and step length, with abnormal gait patterns, making post-stroke walking difficult. Improving gait patterns is crucial for safety during walking. (Masataka Yamamoto, 2019) The anterior cruciate ligament (ACL) is crucial for knee joint stability, but injuries can cause pain and reduced activities. Diagnosis often involves clinical exams, arthroscopy, or imaging, but these have limitations. Gait analysis could be an alternative, as patients with ACL deficiency often exhibit abnormal gait patterns. (Wei Zeng, 2021) This study evaluates the effectiveness of TeraTogs soft orthotics, combined with exercise training, on balance and gait performance in children with dyskinetic cerebral palsy. Further research is needed to address postural instability, improve mobility, and facilitate functional activities. (Shamekh Mohamed EI-Shamy, 2022) This study investigates the relationship between pain phenotype and gait analysis in patients with end-stage knee osteoarthritis (OA), focusing on its impact on gait characteristics and the use of preoperative pain tests. (Kengo Harato, 2022) Cerebral palsy (CP) is a non-progressive loss of motor function, posture, and movement due to fetal or perinatal brain damage. It is prevalent worldwide and in Turkey, with a prevalence of 4.4 per 1000 live births. The clinical progression may change over time, with motor and sensory dysfunctions common symptoms. Gait abnormalities vary based on the type of CP and the child's condition. (Ismail Uysal, 2023)

II. Methodology

This work presents an image acquisition subsystem that involves video recording and image capturing and digitization. A tracksuit made from everyday materials is used to highlight different body parts, resulting in more realistic gait patterns and accurate data collection. The system can be applied to medical research. (Howard Lee, 2008). In 2013, the authors met with BioMarin Pharmaceutical Inc. to formulate

advice for orthopedic administration of extremities in Morquio A patients. They reviewed current clinical practices and reviewed literature on the subject. The authors refined and complete advice through the manuscript development process, involving over 100 patients and well-established referral centers. (Klane k .white, 2014)

Gait and motion analysis :

3-D motion and gait analysis using an 8-camera motion analysis system in underwent children. Those childrens were fitted as 34 reflective markers aligned with anatomical landmarks. The lower body was designed using the Newington model, while the upper body was designed using the plug-in gait model. Children walked at a comfortable pace, with gait analysis carried out with barefoot in some studies. (Bartonek, 2015)

Thirteen adult male Long Evans rats were housed in controlled conditions under controlled light/dark schedules. Test conducted according to animal protection act of German and \accepted by the regional animal care commission. Animals were anesthetised and accept carprofen for pain relief. A guide cannula was implanted for deep brain stimulation. (Elena Kordys, 2017)

Surgical intervention and rehabilitation : The pre-operative disorder severity was evaluated using Ahlback's grading system and hip orthogonal radiographs, while postoperative radiographs were scrutinized for accurate hip of-set, leg length, and cup inclination reconstruction. (Anatole V.Wiik, 2018)

Musculoskeletal model and AFO model : The study used marker data and ground reaction force data from a motion analysis system to simulate gait using a musculoskeletal model and an AFO model. OpenSim was used to calculate kinematics and kinetics during gait. The gait2392 musculoskeletal model and the AFO model of the ToyLanding model were connected. The experimental torque value was measured using a Gait Judge System, and the PFR was calculated against plantar flexion movement. (Masataka Yamamoto, 2019)

The study involved 32 recently diagnosed Parkinson's disease (P') patients aged 50-65 years, recruited from Tanta University Hospitals. The patients were asked to stop PD therapy and assess disease severity using the unified Parkinson's disorder ranking scale-III. Olfactory performance was assessed using the extended n-butanol, Burghart Sniffin' Sticks test and brain MRI. The study used chi-square for categorical variables and Pearson's correlation test for statistical analysis. The effect be seen that olfactory effecting in PD sick person was asymmetrical. (Khaled Hussin Rashed, 2020) The proposed method uses dynamical features against kinematic as well as kinetic gait indications to differentiate between ACLD knees with anterior intact knees. It extracts irregular and statistical characteristic, feeds feature vectors into various classification models, and evaluates the classification results using different performance parameters. (Wei Zeng, 2021)Clinical score and patient-reported assessment: The study evaluated patients using the 2011 New Knee Scoring System, PD-Q, and PCS to assess neuropathic pain. Patients were categorized into low, intermediate, and high groups based on PD-Q. PCS was evaluated using total score and subcategories, with a cut-off value of 23 points. (Kengo Harato, 2022)

Edinburgh Visual Gait Score (EVGS) : The study used EVGS to evaluate children's gait, recording it in three different planes and analyzing 17 parameters. The researchers measured EVGS independently in a computer environment, with 0 indicating natural gait, 1 indicating moderate deviation, and 2 indicating severe deviation. (Ismail Uysal, 2023)

III. Conclusion

These review article summarises about gait pattern affected by various diseases. Study of gait pattern used for solving criminal cases as we can recognize various abnormalities a person may have by the analysis of his or her gait pattern. It is used as secondary evidence.

By using gait pattern we can find out individuals age, sex, and height.

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