RELATIONSHIP OF PLANTER PRESSURE AND GLYCEMIC CONTROL IN TYPE 2 DIABETIC PATIENTS WITH AND WITHOUT NEUROPATHY

Thesis

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بسم الله الرحمن الرحيم

{ وَأَنْزَلَ اللهُ عَلَيْكَ الْكِتَابَ والْحِكْمَةَ وَعَلَّمَكَ مَا

لَمْ تَكُنْ تَعْلَمُ وَكَانَ فَضْلُ اللهِ عَلَيْكَ عَظِيمًا}

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List of Abbreviations

Abbreviation	Meaning
ABIs	Ankle brachial indices
BMI	Body mass index
CGRP	Calcitonin generelated peptide
DM	Diabetes mellitus
DN	Diabetic neuropathy
DNA	Deoxyribonucleic acid
DPN	Diabetic polyneuropathy
Fp	Frontal plane
GRF	Ground reaction force
HbA1c	Glycated hemoglobin
HS	Heel strike
IP	Interphalangeal
KPa	Kilo Pascal
LDDP	Length-dependent diabetic polyneuropathy
LH	Lateral heel
LJM	Limited joint mobility
M1	First metatarsal area
M2	Second metatarsal area
M3	Third metatarsal area
M4	Forth metatarsal area
M5	Fifth metatarsal area
MF	Mid foot area

Abbreviation	Meaning
MH	Medial heel
MTP	Metatarsophalangeal
PAD	Peripheral arterial disease
PDN	Proximal diabetic neuropathy
PPP	Peak plantar pressure
PTI	Pressure-time integral
Sp	Sagittal plane
STP	Stance phase
T1,T2,T3	Toe areas
TO	Toe off
Tp	Transverse plane

Introduction

Diabetes mellitus (DM) is a common metabolic disorder .The most common form of diabetes is type 2 diabetes. These metabolic abnormalities lead to long-term damage of various organs, causing their dysfunction and failure. Diabetes-related micro-vascular complications are responsible for the majority of new cases of blindness, kidney failure, and non-traumatic amputations***(American Diabetes Association 2013).***

Diabetic neuropathy is the most common and troublesome complication of diabetes, leading to the greatest morbidity and mortality and resulting in a huge economic burden for diabetic care ***(Vinik et al, 2003).***

Diabetes mellitus is the leading cause of non-traumatic lower limb amputations, with a 15- to 40-fold increase in risk over that of the non-diabetic population ***(Turns, 2011).***

Type 2 diabetes mellitus (DM) patients have an elevated risk of plantar ulceration compared to the normal population. The main risk factors for plantar forefoot ulcers are loss of protective sensation due to sensory neuropathy and increased mechanical stress on the sole of the foot. The parameters of plantar pressure, length of contact time and pressure-time integral (PTI) were determined by pedography at defined foot regions ***(Sauseng et al, 1999).***

Aim of the work

To examine Relationship of Planter Pressure and Glycemic Control in Type2 Diabetic Patients with and without Neuropathy.

Diabetic Neuropathy

Diabetes mellitus is the most frequent cause of neuropathy worldwide and an increasing load in many developing countries where obesity and type2 diabetes are becoming more common. Most clinical manifestations of diabetic neuropathy were recognized during the second half of the 19th century, but facts on the pathology of the different patterns of diabetic neuropathies have recently become available, with unpredictable findings of inflammatory lesions in focal diabetic neuropathies. Type 2 diabetes is the most frequent type of diabetes. About 90–95% of population with diabetes have type 2, and one third of them have not been discovered ***(Aboderin et al., 2002).***

Type2 diabetes is usually part of a metabolic syndrome that consists of obesity, elevated blood pressure, and high levels of blood lipids ***(Kaur, 2014).***

Diabetes mellitus can be described as a "syndrome of abnormal carbohydrate metabolism with acute metabolic complications and chronic vascular, neurological, and orthopedic complications disturbing most organ systems" .It is a main cause of blindness ,renal disease, heart ,peripheral vascular disease ,and lower limb amputation .Diabetes can have severe complications such as hyperglycemia, ketoacidosis, diabetic neuropathy, retinopathy, nephropathy, peripheral vascular disease and lower limb ulcers. Research has demonstrated ethnic inequality in the prevalence of different diabetic complications such as foot ulcerations ***(Schie et al., 2001).***

Diabetic neuropathy (DN) is the most frequent and annoying complication of diabetes mellitus (DM), leading to the greatest morbidity and mortality and giving rise to a huge economic trouble for diabetes care, of persons with diabetes, 2-3%develop a foot ulcer annually, while the lifetime incidence rate is 15% ***(Stockl et al., 2004).***

It is the most frequent form of neuropathy in the developed countries of the world, explains more hospitalizations than all the other diabetic complications combined, and causes 50% to 75% of non traumatic amputations ***(Vuorisalo et al., 2009).***

DN is a set of clinical syndromes that involve specific areas of the nervous system, singly or combined. It may be silent and go undiscovered while exercising its damages; or it may present with clinical symptoms and signs that, although nonspecific and dangerous with slow progression, also resemble those seen in many other diseases. DN is, accordingly, diagnosed by exclusion. Unluckily both endocrinologists and non endocrinologists have not been prepared to recognize the condition, and even when DN is symptomatic, less than one-third of physicians detect the cause or discuss this with their patients ***(Herman and Kennedy, 2005).***

CLINICAL ASPECTS OF DIABETICNEUROPATHY

More than 80% of patients with clinical diabetic neuropathy have a symmetrical form. In most situations, distal symmetrical polyneuropathy is a sensory neuropathy with distal motor involvement measurable only by electromyography, except in the most serious forms ***(Said et al., 2007).***

CLASSIFICATION

Diabetic neuropathy is classified into definite clinical syndromes. A typical set of symptoms and signs exist for each syndrome, depending on the component of the peripheral nervous system that is damaged. The most frequently detected neuropathies include:

-Distal symmetric polyneuropathy

-Autonomic neuropathy

-Thoracic and lumbar nerve root disease, causing polyradiculopathies

-Individual cranial and peripheral nerve affection causing focal mononeuropathies, especially desturbing the oculomotor nerve (cranial nerve III) and the median nerve.

-Asymmetric involvement of multiple peripheral nerves, resulting in a mononeuropathy multiplex ***(Happichet al., 2007)***

PATHOGENESIS OF DIABETIC NEUROPATHIES

Causative elements include persistent hyperglycemia, microvascular insufficiency, oxidative and nitrosative stress (the reaction of body tissues to nitric oxide, nitrous oxide at levels greater than can be neutralized) defective neurotropism, and autoimmune-mediated nerve destruction ***(Vinik et al., 2006).***

However, DN is a heterogeneous group of conditions with widely fluctuating pathology, indicating differences in pathogenic mechanisms for the different clinical syndromes. Recognition of the clinical homolog of these pathologic processes is the first step in achieving the suitable form of intervention ***(Yasuda, 2013).***