New Modalities In Treatment Of Diabetic Foot

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Ahmed Anter

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List of Abbreviation

18F-FDG	18F fluorodeoxyglucose
ABPI	Ankle Brachial Pressure Index
Ach	Acetylcholine
ACR	The American College of Radiology
ATA	Anterior Tibial Artery
bFGF	Basic Fibroblast Growth Factor
CCK	Cholecystokinin
CT	Computed Tomography
DFU	Diabetic Foot Ulcer
EGF	Epidermal Growth Factor
ESWT	External Shock Wave Therapy
FGF	Fibroblast Growth Factor
GADAs	Glutamic Acid Decarboxylase Antibodies
G-CSF	Granulocyte Colony Stimulating Factor
GIP	Glucose – dependent Insulinotropic Peptide
GLP - 1	Glucagon– Like Peptide – 1
GRP	Gastrin - Releasing Polypeptide
HBO_2	Hyperbaric Oxygen
HIF	Hypoxia Inducible Factors
HLA	Human Leukocyte Antigen
IAAs	Insulin Autoantibodies
ICAs	Islet Cell Antibodies
IDDM	Insulin – Dependent Diabetes Mellitus
IDF	International Diabetes Federation
IDSA	The Infectious Diseases Society of America
IFG	Impaired Fasting Glycemia
IGF	Insulin-like Growth Factors
IGT	Impaired Glucose Tolerance
IL	Interleukin
LJM	Limited Joint Mobility
MDT	Maggot Debridement Therapy
MIC	Minimum Inhibitory Concentrations

MRA	Magnetic Resonance Angiography
MRI	Magnetic Resonance Imaging
MVTR	Moisture Vapor Transmission Rate
NIDDM	Non Insulin – Dependent Diabetes Mellitus
NO	Nitric Oxide
NPWT	Negative Pressure Wound Therapy
NPY	Neuropeptide Y
PACAP	Pituitary AdenylateCyclase Activating Polypeptide
PAD	Peripheral Arterial Disease
PDGF	Platelet Derived Growth Factor
PET	Positron Emission Tomography
PN	Peripheral Neuropathy
PotAGT	Potential Abnormality of Glucose Tolerance
PrevAGT	Previous Abnormality of Glucose Intolerance
PTA	Posterior Tibial Artery
PVD	Peripheral Vascular Disease
rHu-GCSF	Recompinant Human Granulocyte Colony Stimulating Factor
ROS	Reactive Oxygen Species
RNS	Reactive Nitrogen Species
SDF	Stromal Derived Factor
SPCs	Stem/Progenitor Cells
SPP	Skin Perfusion Pressure
SST	Somatostatin
STIR	Short Tau Inversion Recovery
STSG	Split-Thickness Skin Grafting
T1DM	Type 1 Diabetes Mellitus
T2DM	Type 2 Diabetes Mellitus
TBI	Toe Brachial Index
Tc-HMPAO	Technetium Hexa Methyl Propylene Amine Oxime
$TcPO_2$	Trancutaneous Oxygen Tension
TGF-β	Transforming Growth Factor β
TNF-α	Tumor Necrosis Factor-α
TOF	Time of Flight
TPBS	Three-Phase Bone Scan

VAC	Vacuum Assisted Closure
VEGF	Vascular Endothelial Growth Factor
VIP	Vasoactive Intestinal Polypeptide
VPT	Vibration Perception Threshold

Introduction

Diabetes Mellitus is a disease in which either not enough insulin is produced by the pancreas “Type 1” or the insulin that is produced is not recognized by the cells of the body “Type 2”. As a result, both types of diabetes lead to abnormally high blood sugar concentrations ***(Mokdadet al, 2000).***

High blood glucose levels can lead to coma and death. In addition, chronic diabetes through mechanisms that are still not completely understood often results in complications. The medical and surgical management of foot disorders in the patient with diabetes should have as its basis a thorough understanding of the complications and metabolic consequences of diabetes mellitus ***(Veves et al, 2002).***

Diabetic foot ulceration occurs as a consequence of the interaction of several contributory factors. Neuropathy is the major component of nearly all diabetic ulcerations and without loss of protective sensation; patients generally will not ulcerate ***(Stephanie, 2007).***

Neuropathy and foot deformity, when combined with repetitive or constant stress, will ultimately lead to failure of the protective integument and ulceration ***(Reiber et al, 1999).***

Many factors contribute to infection in the diabetic foot including peripheral neuropathy, vascular insufficiency and repetitive minor trauma to an insensitive neuropathic foot predispose to ulcer development ***(Shaw and Zimmet, 1999).***

Osteomyelitis of the foot occurs up to 15% of diabetic patients. Bone infection results from local extension of soft tissue infection as ulcers which serve as conduit for infection to spread ***(Marcus et al, 1996).***

Multiple classification schemes have been designed to define the severity of foot wounds or infection. There are Meggitt-Wagner system and The University of Texas classification of foot wounds each of which can be modified by the presence of ischemia, infection, or both ***(Sanders and Frykberg,2001).***

Imaging modalities play important role in the assessment of the diabetic patient with foot problems. Nuclear medicine and magnetic resonance imaging generally detect osteomyelitis, characterize various soft tissue abnormalities, and depict the extent of bone involvement ***(Schauwecker, 1992).***

Optimal therapy involves the integration of wound care, control of glucose metabolism, antibiotic therapy, debridement, reconstructive foot surgery and possibly vascular reconstruction. However, the effective use of dressings is essential to ensure the

optimal management of diabetic foot ulcers ***(Zamboni et al, 2008).***

There are different new modalities involved in treatment of diabetic foot such as hyperbaric oxygen therapy, growth factors which improve wound healing and reduce incidence of lower extremity amputation ***(Voigt, 2006)***

Aim Of The Work

In This Essay, we aim to review the issue of diabetic foot discussing its pathogenesis & complications and management with spotting on new modalities of treatment.

Diabetes mellitus is a metabolic disorder of multiple etiologies. The name *"Diabetes"* comes from the Greek word for a siphon because the fluid does not remain in the body, but uses the man's body as a channel whereby to leave it. The sweet taste of diabetic urine was recognized at the beginning of the first millennium, but the adjective *"mellitus" (honeyed)* was only added by Rollo in the late 18th century ***(Holt et al, 2010).***

Diabetes mellitus is characterized by chronic hyperglycemia together with disturbances of carbohydrate, fat and protein metabolism resulting from defects of insulin secretion, insulin action or both. The relative contribution of these defects varies between different types of diabetes. These are associated with the development of the specific microvascular complications of retinopathy, which can lead to blindness, nephropathy with potential renal failure and neuropathy. They are also associated with an increased risk of macrovascular disease ***(Nyman et al., 2008).***

Symptoms may be mild or absent and mild hyperglycemia can persist for years with tissue damage developing, although the person may be totally asymptomatic. The characteristic clinical presentations include thirst, polyuria, blurring of vision and