

***Role of Doppler in early detection of
diabetic nephropathy in children with
type-1 diabetes mellitus***

Thesis

Submitted for Fulfillment of Master Degree in Radiodiagnosis

By

Ahmed Abd Elkaream Abd Elsslam

M.B.B.CH
Cairo University

Supervised By

Dr. Hassan Ali Hassan El Kiki

Professor of Radiodiagnosis
Faculty of Medicine
Cairo University

Dr. Rania Hamdy Hashem

Lecturer of Radiodiagnosis
Faculty of Medicine
Cairo University

Dr. Noha Mousa Azzab

Lecturer of pediatric medicine
Faculty of Medicine
Cairo University

Faculty of Medicine
Cairo University

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بِسْمِ اللَّهِ الرَّحْمَنِ الرَّحِيمِ

قَالُوا سُبْحَانَكَ لَا عِلْمَ لَنَا
إِلَّا مَا عَلَّمْتَنَا إِنَّكَ أَنْتَ
الْعَلِيمُ الْحَكِيمُ

صدق الله العظيم

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Dedication

*To my parents, my brother and
my friends, with love,
for their love.*

*To my grandfather, for his never-ending
support.*

ahmed

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List of Abbreviations

- **AER:** Albumin Excretion Rate
- **AG:** Adrenal Gland
- **AGEs:** advanced glycation end products
- **Ang II :** Angiotensin II
- **AT1R:** Angiotensin II Type 1 Receptor
- **BM:** Basement Membrane
- **DM:** Diabetes Mellitus
- **DN:** Diabetic Nephropathy
- **ECM:** Extracellular Matrix
- **EDV:** End-Diastolic Velocity
- **eNOS:** Endothelial No Synthase
- **F-6-P:** Fructose-6-Phosphate
- **GA:** Gonadal Artery
- **GEC:** Glomerular Endothelial Cells
- **GFAT:**Glutamine:Fructose6 Phosphate Amidotransferase
- **GFR:** Glomerular filtration rate
- **GlcN-6-P:**Glucosamine 6-Phosphate
- **GV:** Gonadal Vein
- **G-6-P:** Glucose-6-Phosphate
- **HSPGs:** Heparan Sulfate Proteoglycans.
- **HZG:** Hemiazygos Vein
- **IMA:** Inferior Mesenteric Artery

- **IVC:** Inferior Vena Cava
- **MAPKs:** Mitogen-Activated Protein Kinases
- **MFV:** Mean Flow Velocity
- **MSN:** Mesonephros
- **MTN:** Metanephros
- **mTOR:** Mammalian Target Of Rapamycin
- **NF- κ B:** Nuclear Factor Kappa B
- **NO:** Nitric Oxide
- **OGT:** O-Glcnaactransferase
- **PAA:** Polar Accessory Artery
- **PAI-I:** Plasminogen Activator Inhibitor-I
- **PI:** Pulsatility Index
- **PRF:** Pulse repetition frequency
- **PSV :** Peak Systolic Velocity
- **RA:** Renal Artery
- **RAGE:** Receptor For AGEs
- **RAR:** Renal Aortic Ratio
- **RAU:** Rete Arteriosum Urogenitale
- **RG:** Reproductive Gland
- **RI:** Resistivity Index
- **ROCKs:** Rho Kinases
- **ROS:** Reactive Oxygen Species
- **SA:** Intersubcardinal Anastomoses
- **S-IA:** Subcardinal-Inferior Cardinal Anastomoses

- **SMA:** Superior Mesenteric Artery
- **TGF- β :** Transforming Growth Factor- β
- **UDP-GlcNAc:** Udp-N-Acetylglucosamine
- **US:** Ultrasound
- **VEGF :** Vascular Endothelial Growth Factor

ABSTRACT

Background: Constant increase in the incidence of type-1 diabetes (T1-DM) has made it necessary to have new markers for the early detection of diabetic nephropathy (DN). One of the markers that could be helpful in detecting functional alterations in renal hemodynamics is assessment of the renal resistive index (RI) by using renal Doppler.

Methods: We studied 20 patients with T1-DM (Group-A), which comprised of 8 females and 12 males, with a mean age of 10.8 ± 2.4 years and duration of diabetes of 4 ± 1.1 years. A control group (Group-B) comprising of 20 healthy children, 11 females and 9 males with mean age of 11.5 ± 2 years, was also studied. The following parameters were studied in the two groups: age, serum creatinine, albumin excretion rate (AER), glomerular filtration rate (GFR), glycosylated hemoglobin (HbA1c) and mean renal RI of both kidneys.

Results: We found an increase in the mean RI in diabetic patients versus healthy children; the mean RI in Group-A was $.64 \pm .5$ while it was $.58 \pm .28$ in Group-B ($P < 0.000^*$). This increase in RI had a positive correlation with duration of the disease, GFR and HbA1c levels, but no correlation with AER.