

بسم الله الرحمن الرحيم

Sudan University of Sciences & Technology

College of Graduate Studies

Determination of the Renal Cortical  
Index in Renal Diseases Using  
Intravenous Urography

تحديد الدليل اللعائي الكلوي للأمراض الكلوية باستخدام التصوير  
الاشعاعي للجهاز البولي عن طريق الحقن الوريدي

A proposal submitted for partial fulfillment of the requirements  
of the M.SC degree in diagnostic radiological technology

**Presented by:**

Omer Elzbeir Ahmed Eltatae

**Supervised by:**

Dr. Caroline Edward Ayad

September 2013

**بسم الله الرحمن الرحيم**

## **الاية**

**: قال تعالى**

**قالوا سبحانك لا علم لنا إلا ما علمتنا إنك ( أنت العليم الحليم**

**الاية 32 من سورة البقرة**

## **Dedication**

**TO MY FATHER,**

**MY MOTHER,**

**MY WIFE ,**

**MY BROTHERS ,**

**MY SISTERS ,**

**MY DUGHTER ,**

**MY**

**FRIENDS ,**

**MY COLLEGES**

## **Acknowledgment**

**Firstly I thanks god for every things .Then full regards and thank to my supervisor Dr. Caroline Edwad Ayad who gave me perfect advises ,ideas and motivation to complete this research in success.**

**My thanks also go the staff of radiology department of Omduman Military hospital .**

**I would like to thanks Khawla Hasan , Abd Elrahman Amasieb and all people who have helped me and contributed in this research**

## **Abstract**

Renal cortical index is used to diagnose different kidneys diseases.

The objectives of this study were to determinate the renal cortical index in renal diseases by using intravenous urography for diagnosis the underlying pathology of normal renal subjects and renal with hydronephrosis as well as renal stones .And correlate the renal cortical index to age, gender ,length ,weight ,body mass index and laboratory result of all subjects

.The study performed in Omdurman Military hospital during the period from October 2012 to March 2013. Toshiba apparatus was used in this study. Intravenous urography was performed by using omnipaque as a contrast media injected via vein.

A total of 60 patients ,the age range between 20 years to 73years ,42

( 70% ) of patients were males and 18 (30%) were females ,were examined with IVU, 20 with normal renal subjects and 20 with hydronephrosis and 20 with renal stones.

The study showed the mean of RT renal cortical index for normal subjects, renal stones and hydronephrosis were found to be  $0.34 \pm 0.01$ ,  $0.4 \pm 0.1$ ,  $0.4 \pm 0.03$ . The study shows the mean of renal cortical index for left kidney for normal subjects, renal stones and hydronephrosis  $0.35 \pm 0.01$ ,  $0.4 \pm 0.08$ ,  $0.4 \pm 0.04$ .

The IVU and renal cortical index has great value in different subjects complain of stones and hydronephrosis in normal serum creatinine and blood urea.

iv

## ملخص الدراسة

الدليل اللعائ الكلوي يستخدم في تشخيص امراض الكلي المختلفة . ان الغرض من

هذه الدراسة تحديد الدليل اللعائ الكلوي للمرضي بإستعمال الحقن الوريدي لتشخيص حالات المرضي للمواضيع الكلوية الطبيعية و الحصاوي الكلوية وحالات التموه المائي وبالإضافة للحصاوي الكلوية ونربط الدليل اللعائ الكلوي لشيخوخة و جنس و طول ووزن وكتلة الجسم ونتيجة مختبر كل المواضيع

الدراسة أجريت في مستشفى أم درمان العسكري من أكتوبر 2012 إلى مارس 2013 . الماكنة التي آستخدمت في هذه الدراسة كانت توشيبا .

المادة المستخدمة في التصوير كوسيط تباين هي ألامنيوبيك , تم الحقن عن طريق الوريد. تم الفحص علي 60 مريض مدي اعمارهم بين 20 سنة الي 73 سنة , 42 (70%) من المرضي كانوا ذكور, 18 (30%) من

المرضي كانوا اناث. 20 مريض حالتهم طبيعية , 20 مريض بالحصاوي  
الكلوية , 20 بإقصاء مائي .

نتائج هذه الدراسة كانت كالآتي متوسط دليل الحائي للكلية اليمنى  
للحالات الطبيعية والتموه الكلوي وحصاوي الكلوي كالآتي  $0.34 \pm 0.01$   
و  $0.4 \pm 0.03$  , و  $0.40 \pm 0.1$

ومتوسط الدليل اللحائي الكلوي للكلية اليسرى للحالات الطبيعية و  
لحالات حصاوي الكلوي للحالات الطبيعية و حالات التموه الكلوي  
وحصاوي الكلوي كالآتي  $0.35 \pm 0.01$  و  $0.40 \pm 0.04$  و  $0.4 \pm 0.08$

التصوير الكلوي بالاشعة السينية عند استخدام الصبغة الملونة والدليل  
للحائي الكلوي لهما قيمة عظيمة في مختلف الحالات التي تشتكي من  
الحصاوي الكلوية و التموه الكلوي عندما تكون مستويات مصل الكرتينين  
و البولينيا بالدم طبيعية

## v

### List of abbreviation

left	LT
centimeter	CM
Mille liter	ML
Ureteropelvic junction	UPJ
Upper urinary tract infection	UTI
Intravenous urography	IVU
Kidney ureter bladder	KUB
Internal cystitis	IC
Mille gram	MG
Blood urea nitrogen	BUN
Deli liter	DL
Computed tomography	CT

technetium	TC
Kilo volt	KV
Mille ampere	MA
second	S
Renal cortical index	RCI
Mille meter	MM
Body mass index	BMI
right	RT
Standard deviation	STVD
kilogram	KG
Di ethylene tri amine pent acetic acid	DTPA
Mercatoacety tri glycine	MAG
Di mercapto succinic acid	DMSA

## vi

### List of figures

Page	Title	Figures
6	Anatomy of the urinary system.	Figure 2.1
6	The structure of a kidney.	Figure 2.2
28	Gender distribution.	Figure 4.1
30	Mean and standard deviation (STDV) of the variables for the subjects with renal stone.	Figure 4.2
31	The mean and standard deviation (STDV) of the variables for the subjects with renal	Figure 4.3



	hydronephrosis.	
32	A scatter plot diagram shows linear relationship between the BMI and RT kidney length.	Figure 4.4
33	A scatter plot diagram shows linear relationship between the BMI and RT kidney width.	Figure 4.5
33	A scatter plot diagram shows linear relationship between age of normal subjects and the RT kidney length.	Figure 4.6
34	A scatter plot diagram shows linear relationship between age of normal subjects and RT kidney width.	Figure 4.7
34	A scatter plot diagram shows linear relationship between blood urea for normal subjects and right renal cortical index.	Figure 4.8
35	A scatter plot diagram shows linear relationship between serum creatinine in normal subjects and Rt renal cortical index.	Figure 4.9
35	A scatter plot diagram shows linear relationship between age of normal subjects and RT renal cortical index.	Figure 4.10
36	A scatter plot diagram shows linear relationship between BMI for normal subjects and RT renal cortical index.	Figure 4.11
36	A scatter plot diagram shows linear relationship between age of normal subjects and Lt kidney length.	Figure 4.12
37	A scatter plot diagram shows linear relationship between BMI and LT kidney width.	Figure 4.13
37	A scatter plot diagram shows linear relationship between BMI and LT renal cortical index.	Figure 4.14
38	A scatter plot diagram shows linear relationship between age of subjects with stone and RT kidney length.	Figure 4.15
38	A scatter plot diagram shows linear relationship between age of subjects with stones and RT kidney width.	Figure 4.16

## vii

39	A scatter plot diagram shows linear relationship between age of subjects with stones and RT kidney	Figure 4.17
----	--	-------------

	cortical index.	
39	A scatter plot diagram shows linear relationship between BMI of subjects with stone and RT kidney length.	Figure 4.18
40	A scatter plot diagram shows linear relationship between BMI of subjects with stones and RT kidney width.	Figure 4.19
40	A scatter lot diagram shows linear relationship between BMI of subjects with stone and RT renal cortical index.	Figure 4.20
41	A scatter plot diagram shows linear relationship between BMI of subjects with stone and LT kidney cortical index.	Figure 4.21
41	A scatter plot diagram shows linear relationship between BMI of subject with stones and LT kidney width.	Figure 4.22
42	A scatter plot diagram shows linear relationship between BMI of subject with stones and LT kidney length.	Figure 4.23
42	A scatter plot diagram shows linear relationship between BMI of subject with stone and RT kidney length.	Figure 4.24
43	A scatter plot diagram shows linear relationship between age of subject with stone and LT kidney length.	Figure 4.25
43	A scatter plot diagram shows linear relationship between age of subject with stones and LT kidney width.	Figure 4.26
44	A scatter plot diagram shows linear relationship between age of subjects with stone and LT kidney cortical index.	Figure 4.27
44	A scatter plot diagram shows linear relationship between age of subject with hydronephrosis and RT kidney length.	Figure 4.28
45	A scatter plot diagram shows linear relationship between age of subject with hydronephrosis and RT kidney width.	Figure 4.29
45	A scatter plot diagram shows linear relationship between age of subject with hydronephrosis and RT renal cortical index.	Figure 4.30
46	A scatter plot diagram shows linear relationship between age of subject with hydronephrosis and LT	Figure 4.31

	kidney length.	
46	A scatter plot diagram shows linear relationship between age of subject with hydronephrosis and LT kidney width.	Figure 4.32
47	A scatter plot diagram shows linear relationship between age of subject with hydronephrosis and LT renal cortical index	Figure 4.33
47	A scatter plot diagram shows linear relationship between age of subject with hydronephrosis and RT kidney length.	Figure 4.34
48	A scatter plot diagram shows linear relationship between age of subject with hydronephrosis and RT kidney width.	Figure 4.35
48	A scatter diagram show linear relationship between age of subject with hydronephrosis and RT renal cortical index.	Figure 4.36

### viii

49	A scatter plot diagram shows linear relationship between BMI of subject with hydronephrosis and LT kidney length.	Figure 4.37
49	A scatter plot diagram shows linear relationship between BMI of subject with hydronephrosis and LT kidney width.	Figure 4.38
50	A scatter plot diagram shows linear relationship between BMI of subject with hydronephrosis and LT renal cortical index.	Figure 4.39
50	A scatter plot diagram shows linear relationship between blood urea for subject with stone and RT renal cortical index.	Figure 4.40
51	A scatter plot diagram shows linear relationship between blood urea for subject with stone and LT renal cortical index.	Figure 4.41
51	A diagram shows linear relationship between creatinine level for subjects with stones and RT renal cortical index.	Figure 4.42
52	A scatter plot diagram shows linear relationship between serum creatinine level for subjects with stones and LT renal cortical ratio.	Figure 4.43
52	A scatter plot diagram shows linear relationship	Figure

	between blood urea for subject with hydronrphrosis and RT renal cortical index.	4.44
53	A scatter lot diagram shows linear relationship between blood urea for subjects with renal hydronephrosis and LT renal cortical index	Figure 4.45
53	A scatter plot diagram shows linear relationship between serum creatinine level for subject with hydronephrosis and RT renal cortical index.	Figure 4.46
54	A scatter plot diagram shows linear relationship between blood serum creatinine for subject with hydronephrosis and LT renal cortical index	Figure 4.47
54	A scatter plot diagram shows linear relationship between age of normal subjects and LT renal cortical index	Figure 4.48

## ix

### List of Tables

<b>Pages</b>	<b>Title</b>	<b>Tables</b>
28	The gender distribution for normal subjects, patients with hydronephrosis and patients with stones.	Table 4.1
29	The mean and standard deviation (STDV) for the variables of the normal subjects.	Table 4.2
29	The mean and standard deviation (STDV) of the variables for the subjects with renal stone .	Table 4.3
30	The mean and standard deviation (STDV) of the	Table 4.4

	variables for the subjects with renal hydronephrosis.	
31	The mean and standard deviation of the right kidney (RT) characters for normal subjects and subjects with renal stone and subjects with renal hydronephrosis.	Table 4.5
32	The mean and standard deviation of the left kidney (LT) characters for normal subjects and subjects with renal stone and subjects with renal hydronephrosis.	Table 4.6

**x**

## Table of Contents

<b>Page number</b>	<b>Topics</b>
i	الاية
ii	Dedication
iii	Acknowledgement
iv	Abstract

v	Arabic Abstract
vi	List of Abbreviations
vii	List of figures
x	List of tables
xi	Table of Contents
1	<b>Charter One : Introduction</b>
1	Introduction
2	Problem of the study
2	Objectives
3	The scope of the study
4	<b>Chapter Two : Literature review</b>
4	Anatomy
8	Physiology
11	Pathology
16	Image considerations
23	Previous Studies
25	<b>Chapter Three : Methodology</b>
25	Materials
26	Methods
28	<b>Chapter Four : Results</b>
28	Results

## xi

55	<b>Chapter Five : Discussion, Conclusion and Recommendations</b>
55	Discussion
62	Conclusion
63	Recommendations

64	References
65	Appendices