



Abstract

Assessment of the hepatobiliary system by nuclear medicine techniques in infant age of twelve months indicated to help determine the etiology of jaundice. The majority of cases occur in children in the first three month of life. This article primarily addresses the use of hepatobiliary scintigraphy in the neonatal period, but it also identifies other conditions that can occur in the first 12 month of life. The aim of this study was to characterize liver imaging objectively so as to overcome the subjectivity of the diagnosis.

One hundred and thirty five infants under 12 months age (65 females and 70 males) were studied in nuclear medicine department. ^{99m}Tc HIDA scan was administered intravenously, and images obtained for up to 24 hours or until gastrointestinal excretion was noted.

The results of this study showed that there is linear relationship between count at 5 minute and time from 10 to 60 using 5-minute interval, demonstrate this relationship; which start at 1.2 counts/minute at 10 minute up to 1.5 at 60 minute. And the absorption of radiopharmaceutical (^{99m}Tc HIDA) From 5 min until 35 min shows there was slightly decreases in excretion of radiotracer from 35 min up 60min but still more the base count at 5 minute. The hepatic activity washout, also called percent of radiotracer excreted, can be expressed by a percent clearance from T max to a specific time (typically at 30, 45, 60, and 90 min).

Hepatobiliary scintigraphy should be used as part of the overall evaluation of neonates and infants with cholestasis and jaundice.

المستخلص

تقييم جهاز الصفراوية بواسطة تقنيات الطب النووي في سن الرضع من اثني عشر شهراً ساعدت في تحديد مسببات اليرقان .معظم الحالات تحدث للأطفال في الثلاثة أشهر الأولى من العمر .ويتناول هذا المقال في المقام الأول على استخدام المسح الذريللصفراوية في فترة ما بعد الولادة، ولكنه يحدد أيضا الشروط الأخرى التي يمكن أن تحدث في الاثني عشر شهراً الأولى من العمر .و الهدف من هذه الدراسة تحديد خصائص تصوير الكبد بشكل موضوعي باستخدام التحليل الكمي.

المواد والطرق :

تمت دراسة مائة وخمسة وثلاثين رضيعاً و الذين لا تقل أعمارهم عن اثني عشر شهرا (٦٥ من الإناث و ٧٠ من الذكور)، في قسم الطب النووي في مركز الرعاية الملكية بالخرطوم خلال السنوات ٢٠١٢-٢٠١٥، باستخدامالمسح الذري(99mTc HIDA)عن طريق الحقن الوريدي، -الصور تم الحصول عليها لمدة تصل إلى 24 ساعة - أو عنملاحظة إفراز المعدة والأمعاء.

أظهرت نتائج هذه الدراسة أن هناك علاقة خطية بين أول 5دقائق والوقت من10-60 دقيقة باستخدام مراحل كل 5 دقائق ، تثبت هذه العلاقة .التي تبدأ عند 1.2 تعداد /دقيقة في 10دقائق تصل إلى 1.5 في 60دقيقة . امتصاصالمواد الاشعاعية(Tc99m HIDA) من 5دقائق حتى 35دقائق يظهر ان هناكنقصاً قليلا في امتصاص الاشعة من 35دقيقة يصل حتي 60 دقيقة ،لكن لا تزال القاعدة الأساسية ثابتة في 5دقائق .ويمكن التعبير عن إخفاق النشاط الكبدي، بالنسبة المئوية للتخلص من المادة المشعة في مدة أقصاها تحديداً في 30الأوقات الآتية :30، 45، 60، و 90 دقيقة.

المسح الذريلللكبد ينبغي أن يستخدم كجزء من التقييم الشامل لحديثي الولادة والرضع المصابين بالتهاب الصفراوية واليرقان.

Dedication

To the soul of my dear father

To the soul of my dear Grandfather

To my dear mother

To my dear husband

To my dear brothers Alamine & Mohammed Alhadey.

To all my family and friends.

Acknowledgment

*I would like to thank Allah for giving me the patience and the strength to finish this research, I owe a debt of thanks and appreciation to **Dr. Mohamed Elfadil** for supervising this research. Also I would like to thank **my mother, husband and brother** which support me.*

Table of contents

Content	NO
الاية القرانية	I
Abstract in English	li
Abstract in Arabic	Iii
Dedication	Iv
Acknowledgment	V
Chapter one	
Introduction	1
1.1 Anatomy of the liver	2
1.1.1 Basic liver architecture	3
1.1.2 Sinusoids	4
1.1.3 Portal hepatic system	5
1.1.4 Gallbladder and biliary system	6
1.2 Physiology of the liver	8
1.2.2 Flow distribution	8
1.2.3 Physiology of Liver Preservation	9
1.2.4 Physiology of gallbladder	11
1.3 Principle of nuclear medicine	14
1.3.1 Role of nuclear medicine in diagnosis	15
1.4 Biliary excretion	16
1.4.1 Radiopharmaceuticals	16
1.4.2 Hepatobiliary Scintigraphy Technique	16
1.4.3 Qualitative Assessment of Hepatobiliary Scintigraphy	19
1.4.4 Quantitative Analysis in Hepatobiliary Scintigraphy	19
1.4.5 Clinical Applications of Hepatobiliary Scintigraphy	22
1.5 Research problems	28
1.6 Objective	28
1.7 Importance of study	29
1.8 Overview of the study	29
Chapter two	
Literature review	30
Chapter three	

Methodology	54
3.1 Instrument of data collocation	54
3.2 Sample size	54
3.3 Method of data collocation	55
3.4 methodology	55
3.4.1 Patient preparation	55
3.4.2 Procedure	55
3.5 Variable of data collocation	56
3.6 Method of data analysis	56
3.7 Study area	56
Chapter four	
Result	57
Chapter five	
5-1 Discussion	67
5-2 Conclusion	69
5-3 Recommendation	70
References	71

List of figure

Content	NO
Figure 1.1 the liver	3
Figure 1.2: Network of branching and rebranching blood vessels in the liver.	4
Figure 1.3: The liver lobule with portal canals (hepatic artery, portal vein and bile duct), sinusoids and collecting central veins.	4
Figure 1.4: Detailed view of the liver sinusoidal structure.	5
Figure 1.5: Anterior view of portal hepatic system.	6
Figure 1.6: Gallbladder and biliary system.	8
Figure 1.7: (a) show normal 60-min anterior image demonstrates a filled GB abutting the duodenal activity, (b) show the image corresponding to the trough GB activity at minute 24 from the start of CCK injection, (c) The image corresponding to the trough GB activity at minute 24 from the start of CCK injection	19
Figure 1.8 A normal curve following cholecystokinin.	19
Figure 1.8: The image at 50 min revealed an unequivocal gallbladder filling with radioactive bile (arrow), but no activity in the bowel	23
Figure 1.9: A 72-day-old infant boy with persistent jaundice demonstrates no biliary excretion on this ^{99m}Tc-mebrofenin study.	24
Figure 3.1: shows the patient position under gamma camera	55
Figure 4.1: shows the frequency and percentage of the sample distributed based on age.	57
Figure 4.2: show the distribution of gender	57
Figure 4.4: time activity curve at time 5 Min Vs 15 Min	58
Figure 4.5: time activity curve at time 5 Min Vs 20 Min	58
Figure 4.6: time activity curve at time 5 Min Vs 25 Min	59
Figure 4.7: time activity curve at time 5 Min Vs 30 Min	59
Figure 4.9: time activity curve at time 5 Min Vs 40 Min	60
Figure 4.10: time activity curve at time 5 Min Vs 45 Min	60
Figure 4.11: time activity curve at time 5 Min Vs 50 Min	61
Figure 4.12: time activity curve at time 5 Min Vs 55 Min	61
Figure 4.13: time activity curve at time 5 Min Vs 60 Min	62
Figure 4.14: show Coefficient of count for 5 per count at every 5 min up to 60 min	62
Figure 4.16: show the secretion of radiopharmaceutical (^{99m}Tc HIDA)	63

Figure 4.17: show the weight Vs accumulation counts	63
Figure 4.18: show Coefficient of count for per count Vs time every 5 min up to 60 min	64
Figure (A) HIDA scan	76
Figure (B-1) showing basic principles of gamma camera and of components of a gamma camera	99
Figure (B-2) shows Different types of collimator. the field of view of the collimator and the image in crystal.	101
Figure (B-3) shape and structure of Photomultiplier Tube	102
Figure (B-5) electronic circuit of a modern digital scintillation camera	104

Abbreviations

CBD :common bile duct

GB: gallbladder

HIDA : Hepatobiliary scans

CCK: cholecystokinin

MTT :mean transit time (MTT)

NHBDs :non-heart-beating donors .

US :ultrasound

CT : computed tomography

MRI: magnetic resonance) imaging

HIDA: hydroxyiminodiacetic acid .

DISIDA: 2, 6-diisopropylacetanilido-iminodiacetic acid.

BRIDA: bromo-2, 4, 6-trimethylacetanilido-iminodiacetic acid.

GBEF : gallbladder ejection fraction

ROI :region of interest .