

Acknowledgements

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Dedication

To my mother , my husband , my family , my sisters , my brothers and my friends.

Best regard for all .

Abstract

The objectives of the study were to characterize Hepatocellular carcinoma (HCC) in CT images using texture analysis so far for classification and delineation of the HCC and liver, in order to have an objective method to improve the accuracy of the diagnosis and to reduce the number of required invasive procedures . The study was carried out on 200 patient with Hepatocellular (HCC) carcinoma underwent abdominal CT Images, from both gender. The study was conducted from August 2012 to August 2015 in Kingdom of Saudi Arabia- Southern area –Najran City (King Khalid Hospital) and Khartoum state (Modern medical center) with Helical Multi detector CT scanner Siemens machines .

The classification processes were carried out using Interactive Data Language (IDL) program. After all images were classified the data entered into SPSS with its classes to generate a classification score using stepwise linear discriminate analysis to select the most discriminate features that can be used in the classification of abdominal tissues in CT images. Then the delineation of HCC done by furthers processing of the classification using region label function. Similar method was obtained for the same set using grey scale as input instead of the texture.

The result shown that the texture analysis reveal a different underlying pattern of the HCC compared to the normal liver and other abdominal tissues with classification sensitivity 96.5%, and the combination of the texture features throughout the different triphasic image phases provides the highest predictive overall accuracy of 89.1 % using stepwise linear discriminant analysis .

ملخص البحث

هدفت هذه الدراسة إلي توصيف سرطان الخلية الكبدية في صوره الاشعه المقطعية باستخدام التحليل النسيجي ومن ثم تصنيف وتحديد الورم بغرض إيجاد طريقه موضوعيه لتحسين الدقة في التشخيص والحد من الإجراءات الخطرة المطلوبة لتشخيص المرض . أجريت هذه الدراسة علي مائتي مريض مصابون بسرطان الخلية الكبدية من كلا الجنسين بمستشفى الملك خالد باماره نجران بالمملكة العربية السعودية والمركز الطبي الحديث بولاية الخرطوم في الفترة من أغسطس 2012 م إلي أغسطس 2015 باستخدام جهاز الاشعه المقطعية الحلزوني متعدد الكواشف (سيمنس). أجريت عملية التصنيف باستخدام برنامج لغة البيانات التفاعلي ثم أدخلت البيانات بعد التصنيف إلي البرنامج الإحصائي لإيجاد درجة التصنيف ومن ثم تحديد الميزات الأكثر دقة والتي يمكن استخدامها في تصنيف أنسجة البطن في صور الاشعه المقطعية . بعد ذلك تم تحديد الورم بمزيد من التصنيف باستخدام وظيفة تسمية المنطقة .

أهم نتائج الدراسة أن التحليل النسيجي كشف عن وجود نمط مختلف لسرطان الخلايا الكبدية مقارنة بخلايا الكبد الطبيعي وأنسجة البطن الأخرى مع حساسية تصنيف 96.5% ، كما أن الجمع بين ميزات التحليل النسيجي في مراحل التصوير ثلاثي الأطوار وفر أعلى دقة شاملة تنبؤية بلغت 89.1% وذلك باستخدام تحليل التمايز الخطي المتدرج .

List of Abbreviations

abbreviations	Terms
FNH	focal nodular hyperplasia
HCC	Hepatocellular carcinoma
CT	Computerized Tomography
MRI	Magnetic Resonance Imaging
ROIs	Regions of Interest
CAD	computer-aided diagnostic systems
HBV	Hepatitis B Virus
HCV	Hepatitis C Virus
AFP	Alpha-Fetoprotein
AASLD	American Association for the Study of Liver Diseases
(FNA)	fine-needle aspiration
US	Ultrasound
(FOS)	First order statistics measures
(ROC)	receiver operating curves
MDCT	Multidetector computed Tomography
HU	Houns field unit
TLC	Tumor-to-liver contrast
GLCM	Gray-level co-occurrence matrices
(NNs)	neural networks

FLLs	focal liver lesions
AUC	area under curves
(RLM)	Run-Length Matrix features
SFFS	sequential forward floating selection
SFOV	Scan field of View
DICOM	Digital imaging and communication in Medicine
IDL	Interactive Data Language.
HAP	hepatic arterial phase
PVP	Porto venous phase.

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