The Clinical Utility of Contrast-Enhanced Ultrasound and Endoscopic Ultrasound Elastography in Diagnosis of Malignant Hepatobiliary-Pancreatic Lesions

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Faculty of Medicine
Cairo University
By

Mostafa Ibrahim Mostafa

(M.B.B.CH. Cairo University)

Supervisors

Mohamed Serag Zakaria , MD

Head of Tropical Medicine Department

Professor of Tropical Medicine

Faculty of Medicine

Cairo University

Ahmed Sadek Abdel Fattah, MD

Head of Gastroenterology and Hepatology Department

Professor of Tropical Medicine

Theodor Bilharz Research Institute

Naglaa Ali Zayed , MD

Lecturer of Tropical Medicine

Faculty of Medicine

Cairo University

FACULTY OF MEDICINE

CAIRO UNIVERSITY

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For their patience and utmost support.

List of abbreviations

- **AFP** Alpha fetoprotein
- **ALP** Alkaline phosphatase
- **ALT** Alanine transaminase
- **AST** Aspartate transarninase
- **CA 19-9** Carbohydrate Antigen
- **CEUS** Contrast Enhanced Ultrasound
- **CE EUS** Contrast Enhanced Endoscopic Ultrasound
- **CEA** Carcinoembryonic Antigen
- **CT** Computerized tomography
- **DCP** Des Gamma Carboxy Prothrombin
- **ERCP** Endoscopic Retrograde Cholangiopancreatography
- **EUS** Endoscopic Ultrasound
- **FDG PET** 18F-Fluorodeoxyglucose Positron Emission Tomography
- **FNA** Fine Needle Aspiration
- **FNH** Focal Nodular Hyperplasia
- **GGT** Gamma glutamyl transpeptidase
- **HBV** Hepatitis B virus
- **HCA** Hepatocellular adenoma
- **HCC** Hepatocellular carcinoma
- **HCV** Hepatitis C virus
- **HFLs** Hepatic focal lesions
- **HIFU** High Intensity focused ultrasound
- **INR** International normalization ratio
- **MRI** Magnetic resonance imaging,
- **NFETs** Non-Functioning Neuroendocrine Tumors
- **PC** Prothrombin concentration
- **PLTs** Platelets
- **PT** Prothrombin time
- **RF** Radiofrequency
- **RFA** Radiofrequency Ablation
- **SCT** Spiral Computerized tomography
- **SD** Standard deviation
- **US** Ultrasound

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ABSTRACT

Title: The Clinical Utility Of Contrast-Enhanced Ultrasound And Endoscopic Ultrasound Elastography In Diagnosis Of Malignant Hepatobiliary-Pancreatic Lesions.

Key Words: Contrast-Enhanced Ultrasound, Endoscopic Ultrasound Elastography

It is well known that some diseases, such as cancer, lead to changes in the hardness of tissue, Sonoelastography, a technique that allows the elasticity of tissue to be assessed during ultrasound examination, provides the ultrasonographer with important additional information that can be used for diagnosis.

Contrast-enhanced Ultrasound is highly efficient for the detection of tumor vascularity in hepatocellular carcinoma, regardless of histological differentiation which can be characterized as hyper vascular lesions in the early arterial and arterial phase with irregular tumor vessels using contrast-enhanced Ultrasound.

The aim of this pilot study was to investigate the clinical utility of contrast-enhanced ultrasound (CEUS) and endoscopic ultrasound (EUS) Elastography in diagnosis of malignant hepatic and pancreatic masses.

This study was conducted on thirty patients with hepatic focal lesions and pancreatic focal lesions attending the Hepatology and Gastroenterology Department, Theodor Bilharz Research Institute (TBRI) in the period between June 2007 and December 2007.

In this study Correlation between Triphasic CT and CEUS in detection of HCC showed, the sensitivity, specificity, Positive Predictive Value (PPV) and Negative Predictive Value (NPV) for malignancy were 78%, 50 % , 93 % and 20 %, respectively, for Triphasic CT and 83 % , 100 % , 100 % and 40 %, respectively for CEUS. No statistically significant difference was found between CEUS and CT in the characterization of hepatic focal lesions ($p > 0.05$). Also both techniques showed good agreement in the findings.

By using EUS Elastography bases on Elastography score established had score 2 which is a heterogenous image with soft tissue range (green, yellow, and red) and corresponds to fibrosis of chronic pancreatitis , 5 (50%) have score 3 which is largely blue (hard) image with minimal heterogenicity and corresponds to small pancreatic adenocarcinoma and 3 (30%) had score 5 which is largely blue image on Elastography but with heterogenicity of softer tissue color (green, red), representing necrosis, and is seen in advanced pancreatic adenocarcinoma .

Correlation between CE EUS and histologically proven of malignant pancreatic tumors showed that the sensitivity, specificity, Positive Predictive Value (PPV) and Negative Predictive Value (NPV) 89%, 100% , 100 % and 50 %, respectively when compared to the gold standard method of diagnosis the histopathology while correlation between EUS Elastography and histologically proven of malignant pancreatic tumors showed that the sensitivity, specificity,

Positive Predictive Value (PPV) and Negative Predictive Value (NPV) for malignancy were 89%, 100%, 100 % and 50 %, respectively.

This study showed that CEUS and CT provide a similar diagnostic accuracy in the characterization of HCC, with a good degree of correlation between the two techniques.

Contrast-enhanced endoscopic ultrasound (CE EUS) improves identification of the vascularization of solid pancreatic tumors. Thus could be considered a complementary imaging modality in the characterization of pancreatic tumors.

EUS Elastography is a new application in the field of endosonography and appears to be capable of distinguishing between fibrous and benign tissue, on the one hand, and malignant lesions on the other.

Introduction

INTRODUCTION

Endoscopic Ultrasound Elastography

Endoscopic Ultrasonography (EUS) provides imaging of tumors and enhances the accuracy of TNM staging. It can also provide guidance for fine-needle aspiration (FNA) and biopsies of undiagnosed masses and lymph nodes suspicious for malignant invasion **(Tamerisa et al., 2005).** However, FNA is technically demanding, and multiple puncturing of lymph nodes or masses is sometimes required in order to obtain sufficient tissue for histological assessment. In addition, when several lymph nodes appear suspicious, the choice of which to puncture is not always clear **(Bhutani et al., 1997)** It is well known that some diseases, such as cancer, lead to changes in the hardness of tissue, Sonoelastography, a technique that allows the elasticity of tissue to be assessed during ultrasound examination, provides the ultrasonographer with important additional information that can be used for diagnosis. Elastography allows assessment of the elastic properties of tissues by applying slight compression to the tissue and comparing the images obtained before and after compression **(Giovannini 2007).** Routine use of EUS elastography thus offers supplemental information that enhances conventional EUS imaging, with a possible decrease in the number of unnecessary EUS-FNA procedures used for tissue confirmation. However, future enhancements of the EUS elastography technology will probably establish the clinical impact of dynamic elasticity imaging **(Adrian 2006).**

Pancreatic lesions have a wide differential diagnosis that includes benign and malignant etiologies, and FNA of the pancreas is associated with a small, but not insignificant, risk of pancreatitis, Hence, the ability to evaluate masses and LN more accurately prior to their puncture in an effort to aid in targeting lesions for FNA and possibly reduce complications would be welcomed by echoendoscopists. Two strategies have been developed with these goals in mind: contrast-enhanced endosonography and sonoelastography **(Giovannini 2007).**

Contrast-Enhanced Ultrasound

Baseline gray-scale and color Doppler ultrasonographic (US) examinations have limited accuracy in the characterization of solid focal liver lesions because the depicted benign and malignant lesions may have similar echo patterns and vascular architectures **(Lee et al., 1996).**