

Chapter Three

Materials and Methods

3.1 MRI system:

MRI machines used for collecting Abdomen images were those at Treatment Home Hospital with Philips intera 1.5 Tesla.

3.2 Design of the study:

This study is analytic study used normal MRI livers for segmentation and classification with presence of gall bladder stone.

3.3 Population of the study:

The population of this study was data set (Abdomen MR Images), where the liver were free from disease but with a presence of gall stone, hepatic and portal veins, ligament and other vessels like IVC in an axial image. The study include both gender with their age ranged from 18 years to 83years old.

3.4 Sample size and type:

This study consisted of 50 patients with each with several axial view that include the liver and they were selected randomly from a set of 200 patients.

3.5 Place and duration of the study:

This study was carried out in the period from January 2015to march 2015 in Khartoum state at Treatment Home Hospital

3-5 Methods of data collection

Technique

Imaging protocols

The liver was imaged using a standard body coil, with section Thickness of 8 mm on all sequences. The MR imaging protocols acquisition of T2-weighted and T1-weighted single Breath-holds sequences, supplemented with anon-breath-hold double T2-weighted sequence. A baseline pre-contrast T1-weighted gradient-echo breath-hold sequence was done in all patients. Dynamic phase images were obtained at arterial phase (30e45s), portal venous phase (60e90s) and equilibrium phase (4e5min).Delayed phase images were obtained after 2h.

3-6 Methods of analysis:

After that MRI images were stored in computer disk were viewed by the Radiant, Ant DICOM in computer to selected the axial images that suit the criteria of research population then uploaded into the computer based software Interactive Data Language (IDL) where the DICOM image converted to TIFF format to suit IDL manipulation. Then the image were read by IDL in TIFF format and the user clicks on areas represents the back ground, liver, abdomen wall, and any other organ. The pixel intensity in these areas was assigned as classification centre, and by using the Euclidian distance between these classes and all the pixels the whole image classified into one of these classes. Then the classification map were further processed by region label to segment the liver from the rest of the structure and convert the segmented live from the classification map to binary image to extract (segment) the liver from the whole original image. Also by applying Sobel function the outline of the binary image will be generated and the spatial

location of the pixels was used to delineate the liver on the original image. The segmented livers were further classified into; liver tissues, ligaments, vessels (portal, hepatic and IVC) and stone. The research clicks on areas represents these classes; in these areas a window of 3×3 pixel were set and the first order statistics were calculated, which include mean, standard deviation, variance, signal, and coefficient of variation, These features were assigned as classification centre used by the Euclidian distances to classify the whole image. The algorithm scans the whole image using a window of 3×3 pixel and computes the first order statistics and computes the distance (the Euclidean distance) between the calculated features and the class's centers and assigns the window to the class with the lowest distance. Then the window interlaced one pixel and the same process started over till the entire image were classified and a classification map were generated. After all images were classified the data concerning the liver, ligament, stone and IVC 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 liver tissues. Where scatter plot using discriminate function were generated as well as classification accuracy and linear discriminate function equations to classify the liver tissue into the previous classes without segmentation process for unseen images in routine work.