ROLE OF MAGNETIC RESONANCE IMAGING IN MALIGNANT HEPATIC NEOPLASMS

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INTRODUCTION AND AIM OF WORK

Hepatic Magnatic Resonance Imaging (MRI) has become a useful imaging modality in recent years.

As with all diagnostic imaging, the scanning techniques available for hepatic MRI are manifold and complex.

The aim of this work is to demonstrate the role of MRI in evaluating cases with hepatic malignant neoplasms.

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MRI ANATOMY OF THE LIVER

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MRI ANATOMY OF THE LIVER

An understanding of the segmental hepatic anatomy with recognition of the major hepatic landmarks and vascular structures is essential for localization of hepatic masses. This has been assessed with angiography, ultrasonogrphy and computed tomography ***(Fisher et al., 1985).***

MRI has the capability of direct imagining in multiple plans and clearly displays vascular channels without the use of contrast media due to flow void phenomenon ***(Fisher et al., 1985).***

The ability to delineate the vascular lumen from the vessel wall and surrounding tissues is based on the fundamental principle that MR signal intensity declines in proportion to the velocity of nuclei moving through an imaged volume. Therefore, no or low signal is emitted from

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vessels with rapid laminar flow (Flow void phenomenon). ***(Bradley, 1988)***.

MRI of the liver could be done on axial, sagittal and coronal planes

On MR Cross axial images, the normal liver is visualized as a homogeneous organ of intermediate intensity on the short TR/TE image. As the T1 relaxation time of normal liver is typically shorter than that of the spleen, the liver should be higher in signal intensity than the spleen on short TR/TE T1-weighted images ***(Kressel, 1988)***.

On long TR/TE T2-weighted images, the liver appears to lose signal and is typically lower in signal than is the normal high intensity spleen ***(Kressel, 1988)***.

The major vascular structures are most consistently demonstrated in the transaxial MR images. This is because

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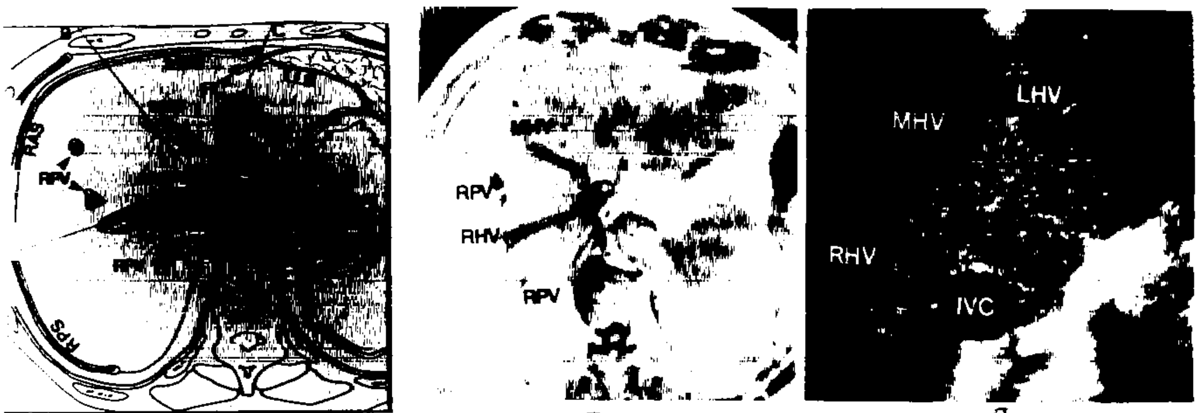
vessels are best seen in sections perpendicular to the flow. Also the problem of partial volume averaging is less in this plane *(Fisher et al., 1985)* (Fig. 1).



A B C

Fig. (1): *Showing segmental anatomy and vascular structures*

A, Transaxial diagram.

B, Transaxial MR image.

C, Transaxial sonogram at same level all at level IVC, and right, left and main hepatic veins.

(John K. MuKai et al., 1987).

The inferior vena cava is consistently demonstrated as a round, signal-free structure grooving the posteroinferior surface of the liver between the right and caudate lobes ***(Fisher et al., 1985; Mukai et al., 1987).***

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The hepatic veins comprise the efferent vascular system of the liver. They lie in the planes between the lobes and segments of the liver. They are thus intersegmental and drain parts of adjacent segments ***(Becker and Cooperberg, 1988)***.

Typically, there are three major branches, the right hepatic vein "RHV" forms the boundary between the posterior and the right paramedian columns of the right lobe. The middle hepatic vein MHV, together with the long axis of the gall bladder GB, forms a plane separating the right and left lobes. The left hepatic vein LHV, within the left portal fissure, separates the two columns of the left lobe ***(Fisher et al., 1985; Mukai et al., 1987)*** (Fig. 1).

On high transaxial MR images, the hepatic veins and their major ramifications could be well seen as tapered linear, signal-free structures in the cephalic part of the

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liver as they course horizontally towards the inferior vena cava. The left and middle veins may unite 1 cm before entering the inferior vena cava *(Fisher et al., 1985)*.

On the middle and more caudal cuts, these veins could be seen as rounded structures as they course in the caudo-cephalic direction. They could also be identified by recognition of their equidistant position between the portal vein branches. In the lower planes of imaging, landmarks other than the hepatic veins should be used to facilitate recognition of the various segments *(Fisher et al., 1985)*.

The main portal (interlobar) fissure is marked in the upper cuts by the middle hepatic vein. In the middle cuts, it is marked by a line drawn from the center of the inferior vena cava through the gall bladder fossa to the liver edge. Caudally, it is easily recognized by a variable amount of fat within the fissure which produces high signals in the T1

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weighted images. Similarly, the left portal (intersegmental) fissure is marked by the left hepatic vein in the crainal sections. In the middle third of the liver, it is recognized by the left portal vein and caudally, it is the falciform ligament which divides the two columns of the left lobe. The ligamentum teres is seen as a round low intensity structure within the free edge of the falciform ligament surrounded by high intenisty fat ***(Fisher et al., 1985; Stark, 1988)***.

The portal vein originates with the confluence of the superior mesenteric and splenic veins behind the pancreatic neck.Within the porta hepatis, it divided into a more caudal and posterior right portal vein and a more cephalad anterior left portal vein ***(Stephens and Sheedy II, 1983)*** **(Fig. 2).**

In contradistinction to the hepatic veins, the portal veins generally lie entirely within the hepatic segments (intrasegmental). The proximal left portal vein is a notable

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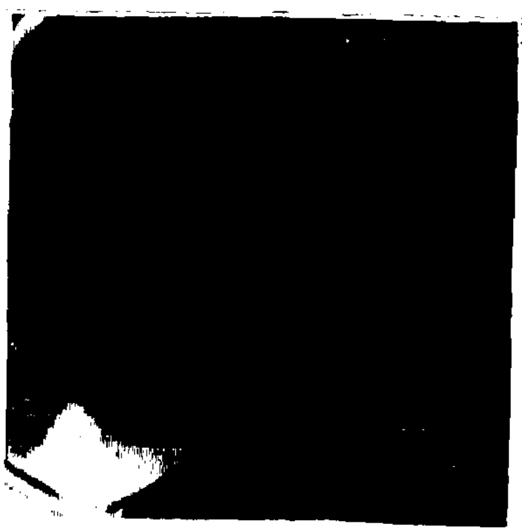

B

Fig. (2): *Showing segmental anatomy and vascular structures.* A, B Transaxial digram and MR image showing, IVC and splenic veins and superior mesenteric vein to form main portal vein (MPV).

(John K. Mukai et al., 1987)

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exception, it communicates with the obliterated umbilical vein which forms the ligamentum teres with the falciform ligament and demarcates the two columns of the left lobe ***(Becker et al., 1988; weissleder and Stark, 1989)***.

While couising intrasegmentally, the portal veins help to define the course of the hepatic veins in the sections through the middle of the liver. The middle hepatic vein is seen between the bifurcation of the main portal vein MPV. The right hepatic vein is seen between the anterior and the posterior branches of the right portal vein RPV ***(Mukai et al., 1987; Stark, 1988)*** (Fig. 3).

The main, right and proximal left portal vein can be seen in the mid-section as signal-free tubular structures. The larger main portal vein MPV can be cosistently seen in the plane caudal to the right portal vein. In mid-sections also, the right portal vein as well as its anterior branch

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