

Assessment of post radiofrequency ablation of HCC with addition of MRI subtraction

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Learning objectives

Recognition of the role of Dynamic MRI in the diagnosis of residual or recurrent HCC after radiofrequency ablation by the addition of subtraction sequence.

Background

- Hepatocellular carcinoma (HCC) is one of the most common cancers worldwide. It has a poor prognosis unless treated.
- Many ablative treatment options are currently of wide use as surgical, chemical, thermal or functional .
- Among all the thermal ablative technique; RFA is the one most widely used for both primary and secondary malignances of the liver.
- Contrast enhanced dynamic CT and MRI are widely used in the post-treatment follow-up of these patents,
- RFA produces coagulation necrosis; sometimes demonstrate imaging features on follow-up studies that could be similar to residual or recurrence.
- There is suggestive evidence that MRI is more accurate than other radiological modalities in the detection of residual or recurrent tumours. The European Association for the Study of Liver Disease (EASL) has recommended the use of lesion enhancement, rather than changes in size, as the standard method to determine treatment response.
- Subtraction imaging in the liver is a relative new technique (used always in breast and angiography) and increasingly used imaging technique in addition to conventional contrast enhanced MRI. Subtraction in the follow-up after RFA and TACE shows successful results in the detection of ablation site recurrence.

Findings and procedure details

- Cases should be subjected to full clinical assessment, laboratory investigations with the revision of their previous radiological investigations.
- Suggested protocol that could be used: Axial T1, T2, T2 SPAIR sequences and dynamic imaging using 3D fat-suppressed T1-weighted gradient echo sequence. The dynamic study is performed after contrast injection consisting of one pre-contrast series followed by at least four successive post-contrast series.
- Subtraction imaging is performed by subtracting the pre-contrast series from the late arterial phase or any phase of choice.
- Images procession could be performed in the workstation.
- Suggested interpretation could be started with reading the conventional dynamic MRI and blinded to the subtraction.
- Then consecutive reading of both dynamic and subtraction MRI images.
- The patients could be categorized into two groups: resolved (well ablated) & unresolved residual) groups.

Images for this section:

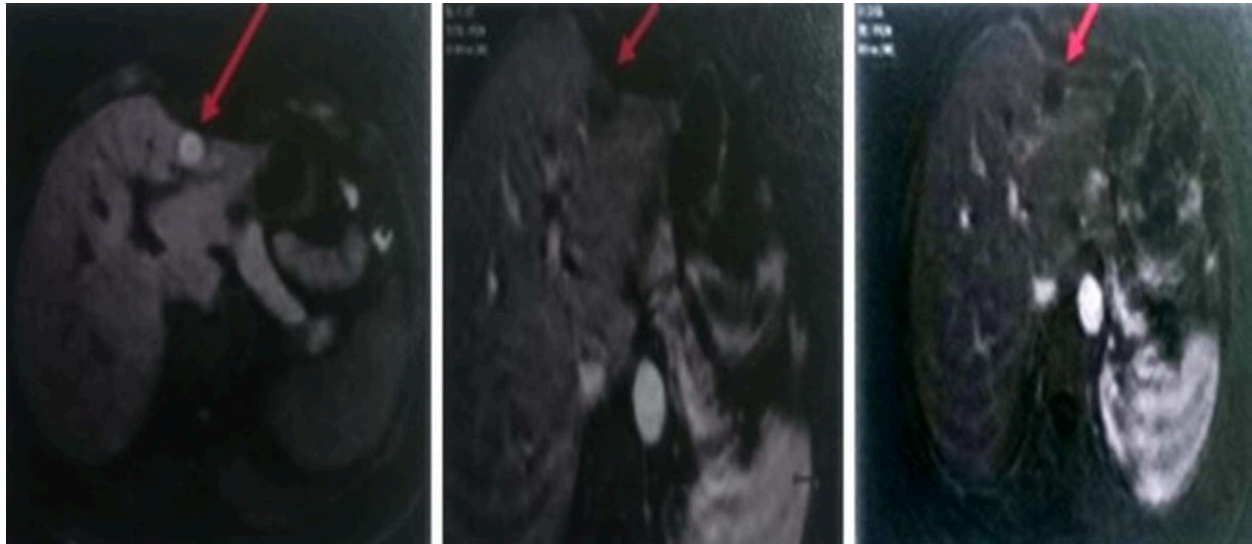


Fig. 1: A,B and C Corresponding axial, contrast, unenhanced, contrast enhanced abd contrast enhanced subtraction T1-weighted images. A completely ablated target zone(TZ) has high signal on the unenhanced T1-weighted image(Red arrow) due to coagulative hemorrhagic necrosis (A) The corresponding contrast-enhanced standard image shows high mixed heterogenous signal in the TZ, which is non-specific and may be due to enhancement or pre-existing T1 high signal. The subtraction image shows no enhancement in the TZ confirming complete treatment necrosis (C) (Red arrow

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Fig. 2: Figure (3).(A) Axial T1-weighted images pre-contrast image shows heterogenous but mostly hyperintense two left lobe hepatic focal lesions(arrows). (B and C) Axial T1-weighted post-contrast images at arterial and delayed phases show area of high signal intensity (red arrow) that could be compatible with either hemorrhagic necrosis or residual tumoral activity and areas of iso- intense signal that relatively fade up on delayed

phases(yellow arrow). (D) Axial T1 subtraction image shows conspicuous area of nodular enhancement, consistent with tumour recurrence (red arrow).

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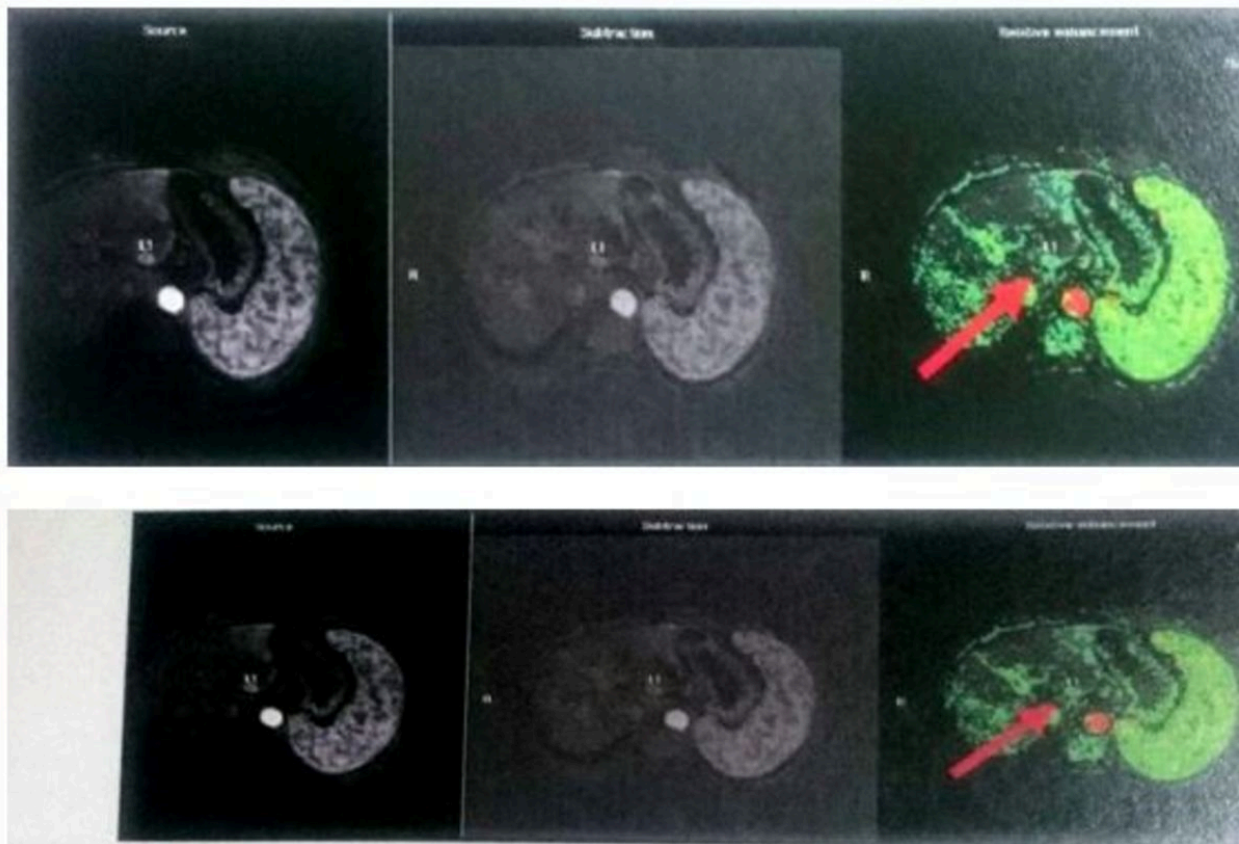


Fig. 3: Figure (3).(A) Axial T1-weighted images pre-contrast image shows heterogenous but mostly hyperintense two left lobe hepatic focal lesions(arrows). (B and C) Axial T1-weighted post-contrast images at arterial and delayed phases show area of high signal intensity (red arrow) that could be compatible with either hemorrhagic necrosis or residual tumoral activity and areas of iso- intense signal that relatively fade up on delayed phases(yellow arrow). (D) Axial T1 subtraction image shows conspicuous area of nodular enhancement, consistent with tumour recurrence (red arrow). Also it shows no enhancement in the smaller lesion confirming complete treatment necrosis and well ablation(yellow arrow). (E) Also this appears more obviously at the colour map images where the well ablated zones appears non enhancing relative to the liver, while the mural residual nodule shows enhancement(red arrow). (F) Enhancement curve(time-signal intensity) for the residual mural nodule(ROI) note the arterial enhancement and the rapid wash out.

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Conclusion

Dynamic MRI is valuable in detecting recurrent lesions however, this value is augmented by the addition of subtraction technique especially in lesions having high T1 signal.

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