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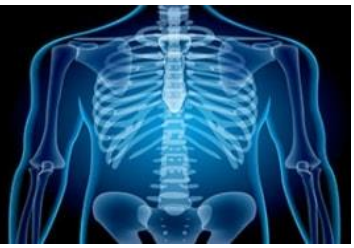

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Comparison between triphasic CT and dynamic MRI in assessment of tumor response in HCC patients after Transarterial chemoembolization

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Abstract
Background: Transarterial chemoembolization (TACE) is the recommended treatment for patients with intermediate-stage hepatocellular carcinoma (HCC) who have many tumors but no invasion of blood vessels. This stage is the most often diagnosed stage at the time of diagnosis. The objective of this study was to compare the efficacy of Triphasic multidetector computed tomography and dynamic magnetic resonance imaging (MRI) in assessing the response of HCC to TACE, specifically in terms of tumor necrosis and viable tumor tissue. The study also aimed to investigate the impact of Lipiodol on the evaluation of tumor necrosis in patients with HCC.
Methods: This prospective study was carried out on 60 patients aged 46 to 70 years old, both sexes, with HCC patients within one month after TACE. All patients were subjected to triphasic- CT and Dynamic MRI for follow up after TACE.
Results: Triphasic CT showed 54.5% sensitivity, 95% specificity, 94.5% positive predictive value (PPV) and 68.7% negative predictive value (NPV) (p<0.001). Dynamic MRI showed 82.6% sensitivity, 97.3% specificity, 96.3% PPV and 85.2% NPV (p<0.001). There was poor agreement between Triphasic CT and Dynamic MRI according to arterial phase (kappa=0.241, 95% CI=0.064-0.298), portal phase (kappa=0.217, 95% CI=0.082-0.187), and delayed phase (kappa=0.7099, 95% CI=0.064-0.298).
Conclusion: MRI is superior to Triphasic CT for the detection of viable tumor residuals after TACE. Compared with multiphasic CT and dynamic MRI has a higher sensitivity.

Keywords: Triphasic CT, dynamic MRI, tumor response, HCC, TACE

Introduction
Hepatocellular carcinoma (HCC) ranks as the fifth most prevalent cancer globally and is responsible for the third highest number of cancer-related deaths. Annually, there are between 600,000 and 1 million newly diagnosed cases of HCC [1, 2].
Cirrhosis is the primary predictor for the occurrence of HCC, especially when it is caused by persistent viral hepatitis or alcoholic cirrhosis [3, 4].
Despite other forms of malignant tumors, histological confirmation is often not necessary for evaluating HCC. Instead, HCC is typically assessed using tumor markers and radiological techniques such as ultrasonography, CT and X-ray [5].
The Child-Pugh score was first introduced by Child and Turcotte as a means of predicting the surgical risk for patients having porto-systemic shunt surgery for variceal hemorrhage. The first iteration of the Child-Pugh score included ascites, hepatic encephalopathy, nutritional status, total bilirubin, and albumin. Pugh *et al*. revised the Child-Pugh classification by including prothrombin time or international normalized ratio (INR) but excluding dietary status. The Child-Pugh score is often used in clinical practice to evaluate the extent of liver disease [6].
Currently, the Barcelona Clinic Liver Cancer (BCLC) algorithm is widely accepted as the standard for allocating treatment in HCC patients [7].
As per the BCLC, Transarterial chemoembolization (TACE) is suggested for patients with intermediate-stage HCC who have several nodules but no invasion of blood vessels. This stage is the most often seen at the time of diagnosis [8].

To choose whether to continue, pause, or stop recurrent TACE, it is essential to have a dependable assessment of therapeutic effectiveness. MDCT and MRI are often used for therapy monitoring [8].

The assessment of the effectiveness of TACE in treating cancer focuses on the reduction of viable tumor size rather than the overall size. To measure the viable portion of the tumor, the European Association for the Study of Liver (EASL) and modified Response Evaluation Criteria in Solid Tumor (mRECIST) have suggested using contrast enhanced MRI [9].

Contrast Enhanced-MRI may provide exact and quantifiable standards for evaluating treatment effectiveness and distinguishing nonviable tumors from viable ones in a quicker timeframe [10].

The MRI evaluation using highly sensitive T_2 weighted sequences and multiphasic contrast enhanced sequences is not affected by the presence of Lipiodol. On the other hand, the use of Multidetector CT involves radiation exposure, which limits its repetitive use. Additionally, the hyper attenuating Lipiodol used during TACE can mask the viable tumor, making it difficult to accurately interpret the response [11].

The objective of this study was to test and compare the efficacy of Triphasic MDCT and Dynamic MRI in evaluating the response of HCC following TACE. The emphasis was on determining the amount of tumor necrosis and viable tumor tissue, with particular attention given to the impact of Lipiodol on the evaluation of tumor necrosis in HCC patients.

Patients and Methods

This research was conducted on a cohort of 60 patients, ranging in age from 46 to 70 years old, of both genders, who had been diagnosed with HCC and had undergone TACE during the last month. The research was conducted between January 2022 and September 2023, after clearance from the Ethical Committee at Tanta University Hospitals in Tanta, Egypt. The patients were received an informed written consent.

The exclusion criteria included individuals with contraindications to MRI, such as the presence of metallic implants like cochlear implants, metallic foreign bodies, or other electronic or magnetically activated implants. Additionally, patients with claustrophobia and contraindications to the administration of contrast media, such as elevated creatinine levels or allergies, were also excluded.

All patients were subjected to history taking, clinical examination and triphasic-CT for follow up after TACE [using MDCT machine. All data was re-evaluated through the Picture Archiving and Communication System (PACS)].

Triphasic CT scan protocol of the liver using Toshiba Aquilion one 16slice multi-detector CT scanner

Patient should be fasting for 6 hours before the scan, drinking plenty of water 20-30 min before to fill the stomach and the bowel loops with water, giving the patient the instructions about table movement, timing, voice orders and pattern of breath holding. Patients lied down in the supine position on CT table with both arms elevated above the head. Low osmolality non-ionic ionized contrast media. (Omnipaque/urographin 300 mg /ml) 1 -1.2 ml/kg I.V. injection; not to exceed 150 ml, flow rate 3.5-5 ml/sec. Scout image to plan study (above the diaphragm to the lesser trochanter. Scan extent from the dome of diaphragm to the iliac crest (arterial phase) or to symphysis pubis (venous phase). Non-contrast scan. IV contrast injected via pump-injector (Medrad 1 syinge). Scan delay: late arterial phase (35-45 s after injection), portal venous phase (60-75 seconds post-injection), delayed phase (2-5 minutes). During the inspiratory phase (breathe hold).

Imaging interpretation: Determine lesion criteria, vascular invasion, tumor response and presence of any complications according to modified Response Evaluation Criteria in Solid Tumors (m RECIST) by evaluation of its pattern of enhancement and detection of its size, margins. To detect deposition of chemo-embolized material inside the lesion. To detect presence of any complications.

Dynamic MRI for follow up after TACE

The procedure was conducted using a machine equipped with 1.5 T magnets. The morphological traits and signal properties of the masses were reassessed using the Picture Archiving and Communication System (PACS). The liver was imaged using a 1.5T superconducting MRI scanner called Signal HD × 14.0, manufactured by GE healthcare. Patient preparation, removing all metal objects, the patient had better fast for 6 hours before the scan, giving the patient the instructions about breath holding. The patient lied down in the supine position over the spine coil, tightened the body coil over the upper abdomen (nipple down to the iliac crest), putting pillows under the head and legs. Localizer, often consisting of fast sequences The T_2-weighted pictures are obtained in three spatial planes: axial, coronal, and sagittal. Sequences: The user's text is incomplete and does not provide any information. Unaltered axial T_1-weighted images. The parameters include a repetition time (TR) ranging from 150 to 200 milliseconds, a minimum echo time (TE), optional fat suppression, a matrix size of 256x192, a field of view of 3/4, a slice thickness/gap of 6/2 millimeters, respiratory gating, and imaging in both axial and coronal planes. A T_2-weighted fast spin-echo sequence (FSE) with spectral fat saturation was performed. The parameters used were as follows: repetition time (TR) of 1,800 milliseconds, echo time (TE) of 85 milliseconds, fast spin-echo factor of 16, matrix size of 512×512, slice thickness of 6 mm with a 2 mm gap between slices. Fat suppression was applied using a severely saturated technique. The T_2-weighted pulse sequences were acquired with a minimum echo time (TE) of 160 milliseconds. Diffusion-weighted sequences (DWI) were produced using a respiratory-triggered procedure with b values of 0, 100, and 700 seconds per square millimeter (sec/mm2). The diffusion-weighted MR sequences were acquired using the single shot echo-planar imaging method (EPI). These sequences included diffusion gradient pulses both before and after the 180° pulse. Spectral fat saturation was consistently employed to eliminate chemical shift artifacts. Axial dynamic contrast-enhanced (DCE) MRI was performed using 3D GRE T_1-weighted sequences at various time intervals after injecting 0.2 mL/kg body weight of Gd-DTPA, which was followed by flushing with 20 ml of sterile 0.9% saline solution through the antecubital vein. The time intervals were as follows: 15-20 seconds (arterial phase), 40 seconds (portal phase), 60 seconds (venous phase), and 180 seconds (delayed phase).

Imaging interpretation: Same as CT study (as regard lesion criteria, vascular invasion, tumor response and presence of any complications) in addition to: [The signal intensity at the non-contrast T_1-weighted and T_2-weighted pulse sequences, assessment of tissue diffusivity of the lesion and the pattern of enhancement of the lesions after dynamic contrast enhanced study].

Statistical analysis

Software developed by IBM (Chicago, IL, USA) called SPSS v27 was used for statistical analysis. Data distribution normality was assessed using histograms and the Shapiro-Wilks test. The quantitative parametric data was analyzed using an ANOVA (F) test with a Tukey post hoc test, and the results were shown as the mean and standard deviation (SD). The median and interquartile range (IQR) were used to depict quantitative non-parametric data. To compare each group, the Kruskal-Wallis test was used with the Mann Whitney-test. Using the Chi-square test, qualitative variables were examined and reported as frequency and percentage (%). A ROC curve was used to assess the sensitivity, specificity, PPV, and NPV of the diagnostic performance. The degree of agreement was shown using Kappa. Statistical significance was determined by a two-tailed P value less than 0.05.

Results

The mean age of patients was 60.03± 5.13 years. There were 50(83.3%) males and 10(16.7%) were females with male to female ratio was 5:1. The median AFP level was 231 ng/dL. Most cases (70%) had high AFP level. Table 1.

Table 1: Demographic characteristics and AFP level among the studied patients

Parameters		**N=60**
Age (years)		60.03± 5.13
Sex	Male	50(83.3%)
	Female	10(16.7%)
AFP level	Normal	18(30.0%)
	High	42(70.0%)
AFP (ng/mL)		231.0(6.2- 690.0)

According to Triphasic CT, no enhancing residual lesions in 48 cases (80.0%), enhancement residual in 12 cases (20.0%) and 2 cases (3.3%) showing newly developed Denovo lesions. According to Dynamic MRI, about 42 cases (70.0%) showing residual enhancement, 18 cases (30.0%) showing no residual enhancement, 3 cases (5.5%) has newly developed lesion.

Table 2: Triphasic CT and dynamic MRI findings among the studied patients

Triphasic CT		**N=60**
Triphasic CT		
Pre-contrast	Adequate hyperdense lipidol	40(60.66%)
	Droplet of hyperdense lipidol	18(30.0%)
	newly developed focal lesion	2(3.3%)
Arterial	Enhancement residual	12(20.0%)
	No enhancement residual	48(80.0%)
	Newly developed	2(3.3%)
Portal	Enhancement residual	2(3.3%)
	No enhancement residual	48(80%)
	Washout	10(16.7%)
Delayed	No Washout	48(80%)
	Washout	12(20.0%)
Dynamic MRI		
T_1Pre-contrast	Hypo intense	40(66.7%)
	Isointense	14(23.3%)
	Hyper intense	6(10.0%)
T_2 Pre-contrast	Hyper intense	38(63.3%)
	Iso-Intense	14(23.3%)
	Hypontense	4(6.7%)
	Heterogeneous	4(6.7%)
Arterial	Enhancement residual	42(70.0%)
	No enhancement residual	18(30%)
	Newly developed	3(3.3%)
Portal	enhancement	2(3.3%)
	no enhancement	18(30%)
	washout	40(63.3%)
Delayed	No Washout	42(36.7%)
	Washout	18(63.3%)

Regarding diffusion restriction, the results showed that 28(46.7%) cases had Homogenous restricted diffusion, 14(23.3%) cases had Heterogeneous restricted diffusion and 18(30.0%) had no restriction. Concerning response, 12(20%) cases activity by CT, 42(66.7%) cases had activity by MRI, 12(20.0%) cases activity by CT and MRI, 18(30.0%) cases No detected activity by MRI, 48(80.0%) cases showing no detected activity by CT. 2(3.3%) cases reported as newly developed lesion by CT, 3(5.0%) cases newly developed lesion by MRI. Table 3.

Table 3: Diffusion restriction and response among the studied patients.

		N=60
Diffusion restriction	Homogenous restriction	28(46.7%)
	Heterogeneous restriction	14(23.3%)
	Total restriction	42(70.0%)
	No restriction	18(30.0%)
Response	Activity by CT	12(20.0%)
	Activity by MRI	42(66.7%)
	activity by CT& MRI	12(20.0%)
	No detected activity by MRI	18(30.0%)
	No detected activity by CT	48(80.0%)
	No activity by CT and MRI	18(30.0%)
	Newly developed by CT	2(3.3%)
	Newly developed by MRI	3(5%)

Lipiodol artifacts and contrast enhancement was often substantially different on in Triphasic CT scans compared to Dynamic MRI scans (p=0.011). Kappa statistics revealed poor agreement between Triphasic CT and Dynamic MRI according to arterial phase (kappa=0.241, 95% CI=0.064-0.298). Contrast washout was often substantially different on in Triphasic CT scans compared to Dynamic MRI scans (p=0.003). Kappa statistics revealed poor agreement between Triphasic CT and Dynamic MRI according to portal phase (kappa=0.217, 95% CI=0.082-0.187). Contrast washout in delayed phase was often substantially different on in Triphasic CT scans compared to Dynamic MRI scans (p=0.016). Kappa statistics revealed poor agreement between Triphasic CT and Dynamic MRI according to delayed phase (kappa=0.7099, 95% CI=0.064-0.298). Table 4.

Table 4: Agreement between Triphasic CT and Dynamic MRI according to arterial, portal and delayed phase

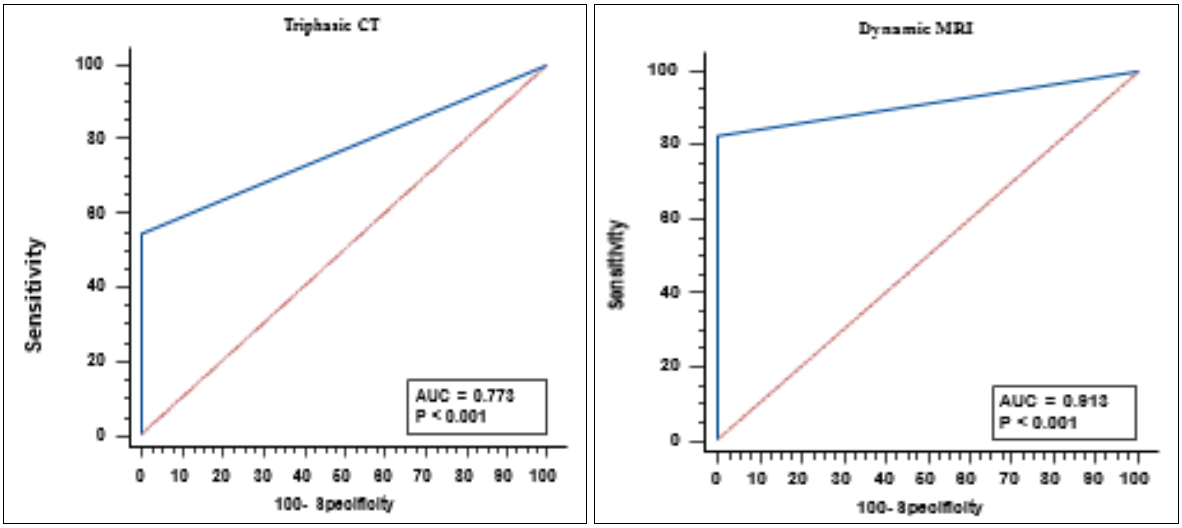
		Triphasic CT (n=60)			**Agreement**		
		No enhancement (n=48)	**Enhancement (n=12)**		**Kappa**	**95% CI**	**P**
Arterial phase							
Dynamic MRI	No enhancement	18(30.0%) (TN)	0 (0.0%) (FN)		0.24 1	0.064 - 0.298	0.011*
	Enhancement	30(50.0%) (FP)	12(20.7%) (TP)				
	Newly developed enhancing	2(3.3%)	0(0.0%)				
Portal phase							
		Enhanced (n=2)	**Not enhanced (n=48)**	**Washout (n=10)**			
Dynamic MRI	Enhanced	2(3.3%) (TN)	0 (0.0%) (FP)	0(0.0%)	20.217	0.082 - 0.187	0.003*
	Not enhanced	0(0.0%) (FN)	18(30.0%) (TN)	0(0.0%)			
	Washout	0 (0.0%)	30(50.0%)	10(16.7%)			
Delayed phase							
		No washout (n=48)	**Washout** (n=12)				
Dynamic MRI	No washout	18(30%) (TN)	0 (0.0%) (FN)		0.181	0.064 - 0.298	0.016*
	Washout	30(50.0%) (FP)	12(20.7%) (TP)				

Table 5: Comparison between triphasic CT and dynamic MRI after TACE

	Triphasic CT	**MRI**
Well ablated	48	18
Residual enhancing	12	42
Newly developed	2	3

In triphasic CT about 48(80.0%) cases showed well ablated lesion with no enhancement residual while in MRI about 18(30.0%) cases showed well ablated lesion with no enhancement residual. In triphasic CT about 12(20.0%) cases showed residual enhancing lesion while in MRI about 42(70.0%) cases showed residual enhancing lesion. In triphasic CT 2(3.3%) newly developed lesion while in MRI 3(5.0%) cases newly developed lesion. Table 5

Triphasic CT showed 54.5% sensitivity, 95% specificity, 94.5% PPV and 68.7% NPV with AUC was 0.733 and p-value was significant (p<0.001). Dynamic MRI showed 82.6% sensitivity, 97.3% specificity, 96.3% PPV and 85.2% NPV with AUC was 0.913 and p-value was significant (p<0.001). Figure 1.



(A) (B)

Fig 1: ROC curve of (A) Triphasic CT and (B) Dynamic MRI in assessment of tumor response in HCC patients after trans-arterial chemoembolization

Case 1: Male patient 54-year-old with liver cirrhosis and HCV positive that underwent TACE as a-loco regional therapy for HCC. Final diagnosis: The Triphasic CT after TACE, showed well ablated hepatic focal lesion, dynamic contrast MRI showed residual tumoral activity with in the previous ablated focal lesion. Figure 2.

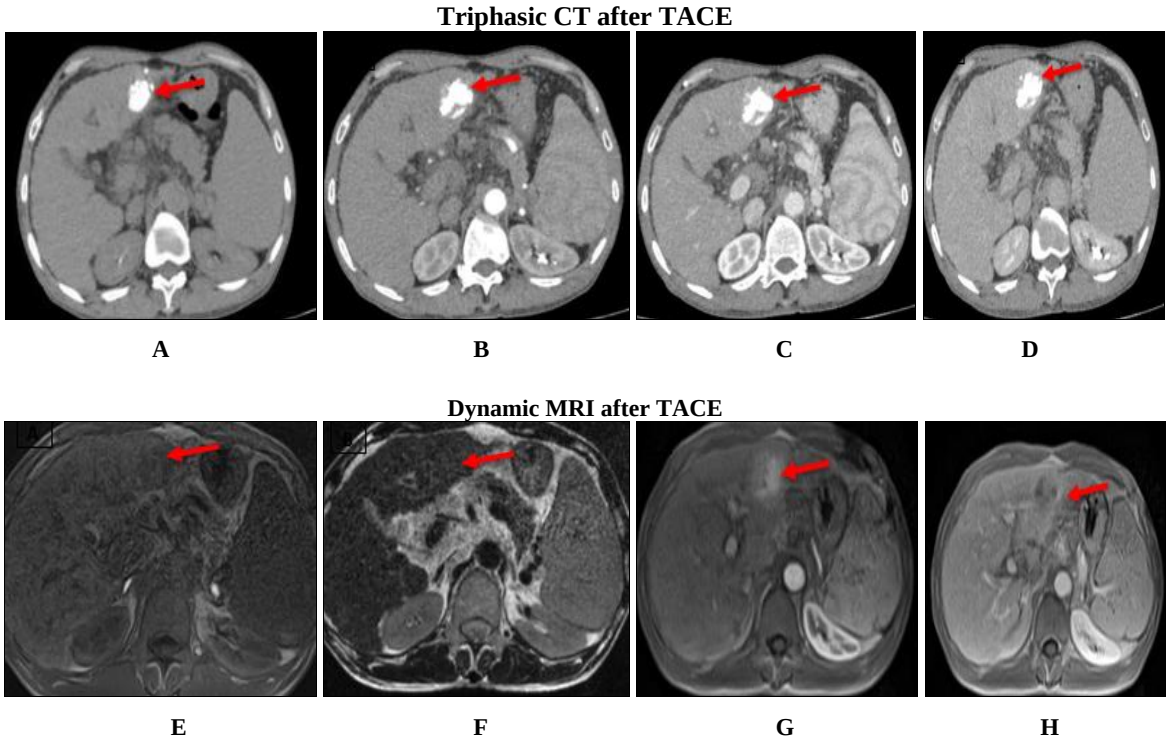


Fig 2: Triphasic CT after TACE showed left lobe segment II focal lesion with hyper dense lipidol uptake in pre contrast image (A), no enhanced residual malignant tissue at arterial phase (B) or Porto venous phase (C) no washout at delayed phase (D), with patent portal vein, no de novo lesion and dynamic MRI after TACE showed

Left lobe segment II focal lesion displayed isointense signal in T1WI (E) isointense signal in T_2WI, (F) with heterogenous enhancement in arterial phase, (G) washout at portovenous phase, (H) there is patent portal vein and no de novo lesion.

Case 2: Male patient, 56-year-old with cirrhotic liver that underwent TACE as a loco regional therapy for HCC. Final diagnosis: The Triphasic CT after TACE, showed well ablated hepatic focal lesion, dynamic contrast MRI showed residual tumoral activity with in the previous ablated focal lesion. Figure 3.

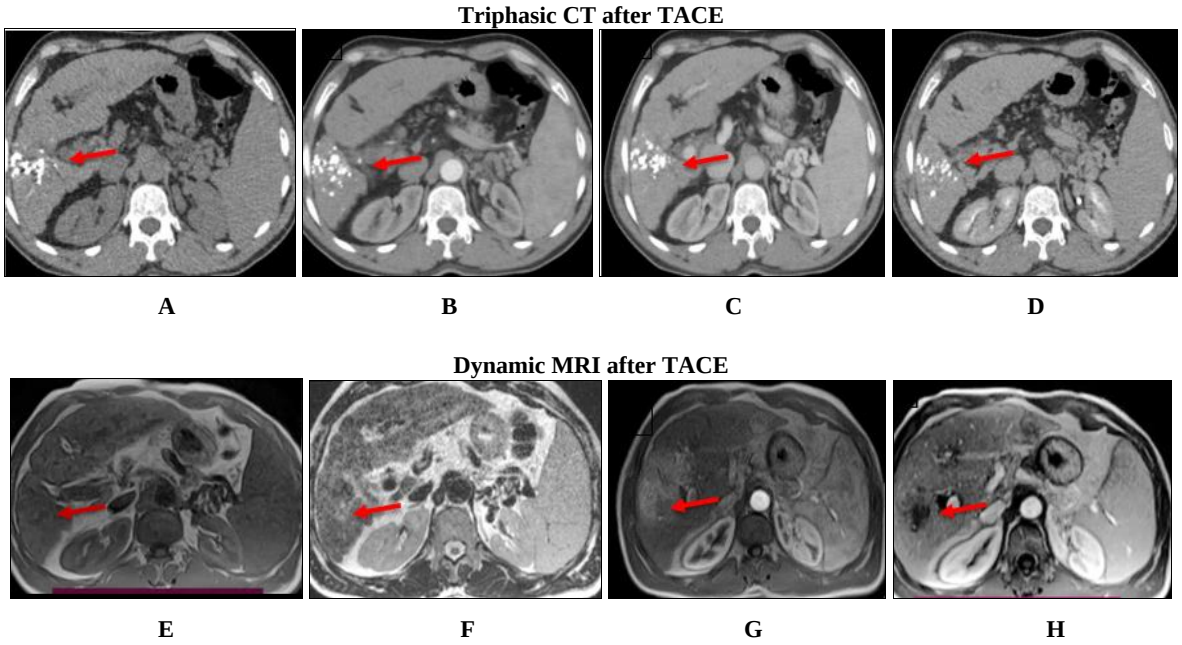


Fig 3: Right hepatic lobe segment VI hyper dense lipidol droplet uptake in pre contrast image (A) showing no enhancement at arterial phase, (B) or Porto venous phase, (C)no washout at delayed phase, (D) with patent portal vein and no newly developed focal lesion. CT showed good therapeutic response with high AFP (4870) and Dynamic MRI AFTER TACE showed right hepatic lobe segment VI hepatic FL that (E) displayed iso intense signal in T1WI, (F) isointense signal intensity in T_2WI, (G) with heterogenous enhancement at arterial phase, (H) washout in porto venous phase

Discussion

HCC is the predominant kind of liver cancer in adults. It ranks as the sixth most prevalent tumor globally and is the third leading cause of cancer-related fatalities, with an annual diagnosis of 600,000 to 1 million new cases [12].

In our study we found that the median AFP level was 231 ng/dL and ranged from 2.1 to 1400 ng/dL. Most cases 42 (70%) had high AFP level. Our results were consistent with Kloeckner R *et al*. [13] reported that The sequential AFP monitoring findings of the 30 patients enrolled in the study were as follows: Out of the total number of cases, 27 individuals had consistently high levels of AFP, whereas the other 3 patients had AFP levels within the normal range.

In our study we found that according to Triphasic CT, Pre-contrast images showed adequate hyperdense lipidol in 40 (66.6%) cases, droplet of hyperdense lipidol in 18(30%) cases. Arterial phase showed that most cases had no enhancement. Contrast washout was detected in 20% cases in portal phase and delayed phase. Also, our results were consistent with Hussain *et al*. [14] found that chemoembolization of total 39 lesions were done, out of which 35 (90%) lesions showed homogenous Type 1 deposition. Two lesions (5%) showed Type 2 deposition of lipiodol; these two lesions were in watershed regions with additional hepatic arterial supply detected on rotational angiography. The other two lesions (5%) showed type 3 deposition of lipiodol, and DYNA CT showed an extrahepatic parasitic supply to these lesions.

In our study we found that according to Dynamic MRI, T_1Pre-contrast images showed hypo-intense in 40 (66.7%) cases, while T_2 Pre-contrast images showed hyper-intense in 38 (63.3%) cases. Arterial phase showed that more than half cases 42 (70.0%) had enhancement. Contrast washout was detected in 40(66.7%) cases in portal phase and 63.3% in delayed phase. Our results were supported by Guirguis *et al*. [15] reported that The study of Pre-contrast T_1revealed that among the 24 cases treated with LR, 25.0% showed heterogeneous T_1signal intensity and 75% showed low T_1 signal intensity. Additionally, 25.0% showed heterogeneous T_2 signal intensity and 75% showed low T_2 signal intensity. In the LR treated nonviable cases, 14.3% showed heterogeneous T_1signal intensity, 85.7% showed low T_1signal intensity, 14.3% showed heterogeneous T_2 signal intensity, 21.4% showed high T_2 signal intensity, and 64.3% showed low T_2 signal intensity. This reliance on conventional MRI sequence for assessing HCC necrosis after TACE is confusing.

In our study we found that regarding diffusion restriction, the results showed that 28 (46.7%) cases had Homogenous restricted diffusion, 14 (23.3%) cases had Heterogeneous restricted diffusion and 18 (30.0%) had no restriction. Our results were supported by Abd El Hak *et al*. [16] showed that among 31 patients with restricted diffusion, 8 cases showed false positive (negative) and 23 true positive (residual) cases with their pattern of diffusion. While the remaining 19 cases had no restriction. Also, our results were consistent with Osama *et al*. [17] reported that In relation to the pattern of diffusion restriction, 76.2% of the instances that were correctly identified as positive showed a distinct limitation in the focal peripheral area. On the other hand, 60% of the cases that were incorrectly identified as positive showed a restriction that was unevenly distributed inside the lesion.

In our study, we found that concerning response, 12 (30%) cases showed residual activity by both CT & MRI, 30 (50.0%) cases had still noted residual activity by MRI, while 18 (30.0%) cases showed no activity by either CT or MRI. Three (5.0%) cases reported newly developed lesion in by MRI and two (3.3%) reported newly developed lesion in by CT. In agreement with our results, Kloeckner *et al*. [13] reported that only 15% of the cases were considered to have a full response according to the European Association for the Study of Liver disease (EASL) when analyzed using MRI. In contrast, MDCT indicated that 46% of the patients had a complete response without any detectable tumor. As a

result, the MRI had a higher number of partial responses (11/13; 85%) compared to MDCT (7/13; 54%). In all, 17 out of 20 patients (85%) had a partial response as determined by MRI, as per the EASL guidelines.

Kappa statistics revealed poor agreement between Triphasic CT and Dynamic MRI according to arterial phase (kappa=0.7099, 95% CI=0.064-0.298). Our results were supported by Lertpipopmetha K, *et al*. [18] reported that Arterial enhancement was observed in 70.4% (19/27) of the HCC nodules using both imaging methods. The agreement for determining whether vascular enhancement was present or absent was 78% (21/27) with a kappa value of 0.289 and a p-value of 0.088. The signal intensity on typical MRI sequences revealed that 41% of nodules exhibited hyperintensity and 41% exhibited hypointensity on T_1-weighted images. On T_2-weighted imaging, the percentages were 70% for hyperintensity and 11% for hypointensity. In our study we found that contrast washout was often substantially different in Triphasic CT scans compared to Dynamic MRI scans (p=0.016). Kappa statistics revealed poor agreement between Triphasic CT and Dynamic MRI according to portal phase and delayed phase (kappa=0.7099, 95% CI=0.064-0.298). Our results were supported by Lertpipopmetha *et al*. [18] found that both imaging modalities identified a tumor washout pattern in 48% (13/27) of the HCC nodules. The agreement for detecting the presence or absence of portovenous/delay washout was 59% (16 out of 27 cases) with a Cohen's kappa coefficient of 0.163 and a p-value of 0.244. On CT, the nodules exhibited a definitive pattern in 21 out of 27 instances, whereas on MRI, the nodules exhibited a definitive pattern in 14 out of 27 cases. CT scans revealed suspicious nodular patterns in 11% of instances, whereas MRI scans showed such patterns in 22% of cases.

Our results about ROC curve analysis were consistent with Guirguis *et al*. [15] found that the sensitivity of dynamic MRI was 95.8%, indicating its ability to accurately detect positive cases. The specificity was 92.9%, indicating its ability to accurately identify negative cases. The positive predictive value was 95.8%, indicating the probability of a positive result being true. The negative predictive value was 92.9%, indicating the probability of a negative result being true. Overall, there was an agreement of 91.4% between dynamic MRI and the reference standard. Furthermore, our findings were in line with those of Abd El Hak *et al*. [16] said that dynamic MRI had a sensitivity of 90.5%, specificity of 96.6%, positive predictive value of 95%, negative predictive value of 93.3%, and an overall agreement of 94%. Diffusion-weighted imaging yielded percentages of 95.83%, 69.23%, 74.19%, 94.74%, and 82% correspondingly.

Limitations of the study included that the sample size was relatively small and the findings must be confirmed in a larger number of patients and the study need longer period follow-up.

Conclusion

MRI is more effective than Triphasic CT in identifying remaining live tumor cells after TACE. Dynamic MRI has greater sensitivity in comparison to multiphasic CT.

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Conflict of Interest: Nil

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