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# Trans-arterial chemoembolization (TACE) in patients with unresectable Hepatocellular carcinoma: Experience from a tertiary care centre in India

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## Abstract

**Aims:** To evaluate the outcome following transarterial chemoembolization (TACE) and to identify the predictors of survival in patients with unresectable hepatocellular carcinoma (HCC). **Material and Methods:** HCC patients reporting to our hospital (2001–2007) were subjected to clinical, biochemical, and radiological examination. TACE was performed in those who fulfilled the inclusion criteria. Follow-up assessment was done with multiphase CT scan of the liver at 1, 3, and 6 months. Tumor response and survival rate were estimated. Univariate and multivariate analyses were done for determinants of survival. **Results:** A total of 73 patients (69 males, 4 females; mean age 49±13.4 years) were subjected to 123 sessions of TACE. The Child's classification was: A – 56 patients and B – 17 patients. Barcelona Clinic staging was: A – 20 patients, B – 38 patients, and C – 15 patients. Tumor size was ≤5cm in 28 (38%) patients, >5–10 cm in 28 (38%) patients, and >10 cm in 17 (23%) patients. Median follow-up was for 12 months (range: 1–77 months). No significant postprocedure complications were encountered. Overall survival rate was 66%, 47%, and 36.4% at 1, 2, and 3 years, respectively. Tumor size emerged as an important predictor of survival. **Conclusion:** TACE offers a reasonable palliative therapy for HCC. Initial tumor size is an independent predictor of survival.

**Key words:** Hepatocellular carcinoma; survival rate; transarterial chemoembolisation

## Introduction

Hepatocellular carcinoma (HCC) is the most common primary hepatic malignancy and the fifth most common cancer worldwide.[1,2] Only a minority of patients with HCC (25%) are found suitable for the current curative treatment options, i.e., surgical resection, liver transplant, and percutaneous ablative therapies.[3] Therefore, palliative management forms the mainstay of therapy for most of the patients with relatively advanced disease. Transarterial chemoembolization (TACE) has evolved over the last two decades as an effective – and the most widely used – palliative treatment for unresectable HCC.[4-7] There are a number of published studies on the efficacy of TACE, including randomized control trials comparing its outcome with supportive therapy.However, most of this experience is from the developed countries.[8-13]

HCC is frequently the long-term sequel of chronic viral infection, mainly hepatitis B (HBV) and hepatitis C (HCV) infection. Since these two viral infections are endemic in Asia and Africa, more than 80% of the HCC burden occurs in these geographical regions.[14] Of the 5.7% of the new HCC cases diagnosed each year globally, 82% of cases and deaths occur in the developing countries.[15]

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In the West, hepatitis C (HCV) infection is the overwhelming cause of HCC;[8] however, in India, HCC has a peculiar variation in terms of epidemiology and the stage of the disease at diagnosis. HBV infection is predominantly encountered and is responsible for 35%–60% of chronic liver disease and 60%–80% of HCC in India.[16,17] Additionally, due to lack of screening programs and delayed care-seeking of the patients, HCC is often diagnosed only at an advanced stage.[16,18] This precludes the use of the curative options, making TACE the most commonly employed treatment modality for patients of unresectable HCC.[16,17]

There is paucity of information on the outcome of HCC patients treated with TACE in India. This prospective case series was designed to bridge this gap in knowledge and is possibly the first study on TACE in India.

## Materials and Methods

Institutional review board approval was obtained prior to the study. Written informed consent was taken from all participants. Consecutive HCC patients presenting to the liver clinic of our hospital between 2001 and 2007 were subjected to detailed clinical, biochemical, and radiological examination. All patients underwent blood investigations,which included complete blood count, liver function tests, and tests for viral markers of hepatitis B and C infection. Serum alpha-fetoprotein (AFP) was estimated using a particle enzyme immunoassay (Axsym System; Abbott Laboratories, Abbot Park, Illinois, USA; normal value <20 ng/ml).Upper gastrointestinal endoscopy was done in each case to detect the presence of esophageal varices.Patients with underlying cirrhosis were classified into Child's A, B or C based on the Child-Pugh classification.[19]

Radiological workup comprised of abdominal ultrasound (USG) and multiphase CT scan (MPCT) of the liver, with contrast-enhanced multiphasic MRI for establishing the diagnosis whenever necessary. For diagnosis of HCC, we followed the modified European Association for Study of Liver (EASL) criteria.[20] This requires either(a) fine needle aspiration cytology (FNAC) or (b) any two of the following: AFP more than 300 ng/ml, arterialization of the mass on contrast-enhanced MPCT, or MRI. MRI was performed on patients who had arterial enhancement with MPCT but did not have the requisite raised AFP values, with an equivocal FNAC. Staging of HCC was done based on the Barcelona Clinic Liver Cancer (BCLC) staging protocol.[21]

TACE was offered to BCLC-B/C HCC patients who fulfilled the following inclusion criteria: patients with associated Child's A or B cirrhosis, normal main portal vein, less than 50% involvement of liver by HCC, and patients willing for therapy and follow-up. Some patients of BCLC A, who were unsuitable for ablative therapy or surgery, were also included. The exclusion criteria included extra hepatic disease; coagulopathy; biliaryobstruction; comorbid illness like coronary artery disease, congestive heart failure, chronic renal failure, etc.; and a previous history of encephalopathy/ upper gastrointestinal bleed in the last 6 months.

TACE was performed through the transfemoral route. Superior mesenteric artery and celiac axis arteriogram were obtained to begin with. Selective cannulation of the hepatic artery supplying the tumor was performed using a 5F celiac catheter and a 0.035-inch J-tip Terumo guidewire. Further, the catheter was placed as close as possible to the tumor using either a 4F multipurpose slip catheter/glide catheter or a 3F microcatheter. The chemotherapeutic drug emulsion was prepared. This consisted of doxorubicin 50 mg (Doxoget, Getwell Life Sciences India Pvt Ltd., New Delhi, India) , cisplatin 100 mg (Cisget, Getwell Life Sciences India Pvt Ltd., New Delhi, India), 10 ml of iodinated non-ionic contrast media and 20ml of iodized oil (lipiodol). This amount of emulsion was ideal for lesions larger than 5cms in size.

The chemotherapeutic drug emulsion was then delivered through this cannulated feeding hepatic artery. In smaller lesions less than 5cm, we used the same emulsion with 10ml of lipiodol. The amount of emulsion to be injected was decided during the procedure. When the lesion showed complete coverage with lipiodol or if there was reflux of emulsion into normal branches, further injection of emulsion was stopped. The amount of emulsion injected varied from case to case. Subsequent to the injection of the emulsion, this feeding artery was embolized using gelatin sponge pledgets/slurry. Intra-arterial lidocaine (10 mg) (Xylocard 2%, Astra Zeneca, Bangalore, India) was given between 10-ml aliquots of chemoembolization material to reduce the pain after embolization. We used a microcatheter-coaxial system to access small and tortuous feeders.

Follow-up after TACE included a detailed clinical examination; serum AFP estimation (if more than 20 ng/ml at enrollment); and MPCT at 1, 3, and 6 months to assess response. If all clinical and biochemical parameters were normal at 6 months following treatment, then MPCT was done at yearly intervals. If the follow-up MPCT showed the following findings: (1) residual or recurrent disease, or development of fresh lesions, and (2) no residual/ recurrent disease or fresh lesions on MPCT but patients having raised serum AFP level, a repeat TACE was undertaken after a gap of 4–6 weeks following the previous session of TACE, only if the Child's status was A/B. If the follow-up imaging showed disease progression then, depending upon the BCLC stage of the disease, the other available treatment options were considered, e.g., percutaneous acetic acid injection and/or radiofrequency ablation or oral chemotherapy.

The main outcome variable of interest was the local tumor

response to TACE as estimated on the basis of MPCT. The tumor response was classified as: disease-free status (complete response), residual disease, recurrence, or development of fresh lesions. These entities were defined as follows: (a) complete response – when the tumor was fully covered with lipiodol and had no enhancing viable tissue; (b) residual disease – when the tumor was partially covered with lipiodol and enhancing viable tissue was seen; (c) recurrence – when the enhancement was seen at the previously treated tumor site, indicating the presence of viable tissue; (d) fresh lesions – when new lesions were detected at different sites in the liver and not at the site where the previously treated tumors were located.

### Statistical analysis

Data analysis was performed using Stata (version 9.0). Continuous data were expressed as mean (SD) or median (range) and categorical data as proportions. Survival was estimated using Kaplan-Meier analysis and the difference among various groups was tested using the log rank test. The overall survival rate at 1, 2, and 3 years was determined

Univariate analysis was done for assessing factors associated with survival using a Cox regression model. Subsequently, all variables which showed some promise of association with mortality ($P$<0.05) in the univariate analysis were put in a step-wise multivariable Cox regression model.

## Results

A total of 77 patients were recruited in this study. TACE could not be performed in four patients due to failure to cannulate the hepatic artery because of blockage or extreme tortuosity at its origin or along its course. The remaining 73 patients were successfully subjected to a total of 123 sessions of TACE (one session in 36 patients, two sessions in 28 patients, three sessions in 6 patients, four sessions in 2 patients, and five sessions in 1 patient).

The clinical profile of the study population is depicted in Table 1. The 73 patients (69 males, 4 females) had a mean age of 49±13.4 years (range: 16–72 years). Only 11 patients were asymptomatic at presentation, the majority having a plethora of symptoms at presentation. The symptoms included right upper quadrant pain in 32 (44%), weight loss in 25 (34.2%), anorexia in 23 (31.5%), and abdominal distension in 14 (19.1%) patients. Of these, Child's A patients were 56 (74%) and Child's B, 17 (26%). HBV infection was the most common etiological factor of HCC, seen in 52 (71.2%) patients [Figure 1]. BCLC A patients were 20 (27.3%), BCLC B patients were 38 (52%), and BCLC C patients were 15 (20.5%). The mean tumor size was 6.6±3.92 cm(range: 1–16 cm). Twenty-eight patients (38%) had tumors of size ≤5 cm, 28 (38%) had tumors of >5–10 cm size, and 17 (23%) had tumors of >10 cm size. A single HCC was present in 34 (46.5%) patients and multiple HCC in 39 (53%) patients. AFP was normal (<20 ng/ml) in 29 (40%) patients.

**Table 1: Demographic profile and clinical features of hepatocellular carcinoma patients (n=73)**

| Variables | Frequency | Percentage |
|---|---|---|
| Age (years) | | |
| Mean (SD) | 49 (+ 13.42) | 67.1 |
| Range | 16-72 | |
| Sex | | |
| Male | 69 | 94.5 |
| female | 4 | 5.5 |
| Presenting symptoms | | |
| Asymptomatic | 11 | 15 |
| Pain | 32 | 44 |
| Weight loss | 25 | 34.2 |
| Anorexia | 23 | 31.5 |
| Abdominal distension | 14 | 19.1 |
| Abdominal mass | 7 | 9.5 |
| Fever | 7 | 9.5 |
| Others (GI bleed, jaundice, oedema) | 19 | 26 |
| Child's class | | |
| A | 54 | 74 |
| B | 19 | 26 |
| Etiological factors | | |
| *HBV | 52 | 71.2 |
| *HCV | 11 | 15.0 |
| ^ Others | 10 | 14 |
| #AST (U/L) | | |
| <40 | 11 | 15 |
| >40 | 62 | 84 |
| #ALT (IU/L) | | |
| <40 | 23 | 31.5 |
| >40 | 50 | 68.5 |
| **AFP ng/ml | | |
| <20 | 29 | 40 |
| 21-300 | 18 | 25 |
| 301-1000 | 12 | 16.4 |
| >1000 | 14 | 20 |
| Number of lesions | | |
| Solitary HCC | 34 | 46.5 |
| Multiple HCC | 39 | 53 |
| ##BCLC Stage | | |
| A | 20 | 27.4 |
| B | 38 | 52.05 |
| C | 15 | 20.55 |
| Size of HCC | | |
| <5 cm | 28 | 38.3 |
| 5-10 cm | 28 | 38.3 |
| >10cm | 17 | 23.29 |

*HBV: Hepatitis B virus, *HCV: Hepatitis C virus, ^ others: Alcohol, cryptogenic, No cirrhosis, Hepatic venous outflow tract obstruction, #AST: Aspartate aminotransferase, #ALT: Aspartate aminotransferase, **AFP: Alpha-fetoprotein, ## BCLC Stage: Barcelona clinic liver cancer staging

The procedure of TACE was well tolerated by all our patients. No complications were encountered during the procedure and the postprocedure complications were mild. Postembolization syndrome was the most common complication in 10/73 (13.6%), which consisted of pain abdomen, fever, nausea, and vomiting. Deranged renal parameters in 10/73 (13.6%) patients and hepatic failure in 3/73 (4.1%) subjects were also encountered.

Patients were followed up for a mean period of 15.6±15.1

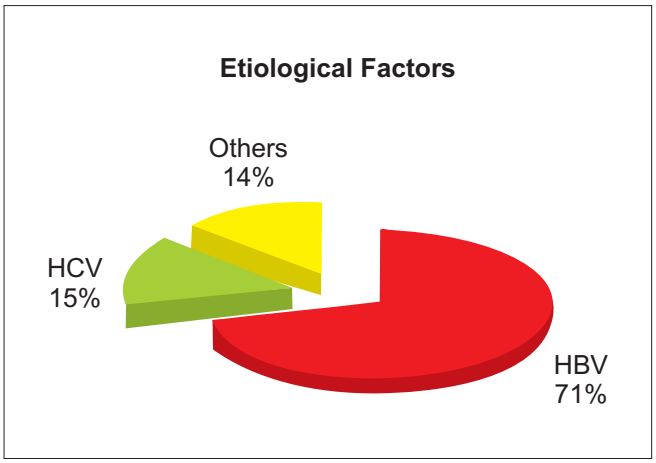


**Figure 1:** Pie chart illustrates the different etiologies of HCC in the study population. Hepatitis B (HBV) is the commonest etiology, seen in 71%

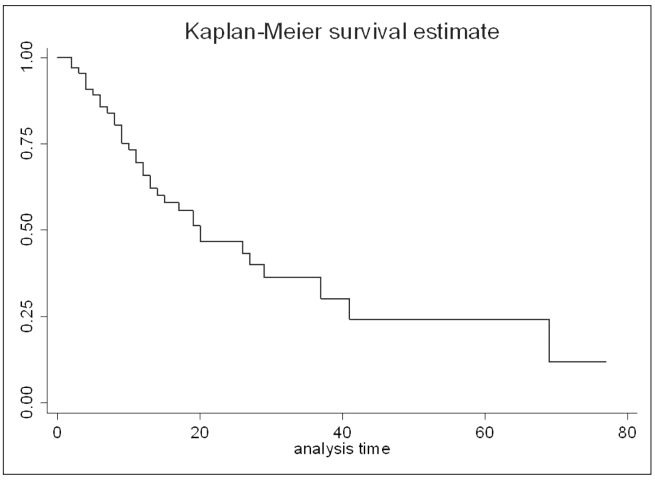


**Figure 2:** Kaplan-Meier survival curve depicts the survival rate of patients following TACE (n=71). The overall survival rate at 1, 2 and 3 years is 66%, 47% and 36.4% respectively

months (range: 1–7 months; median: 12 months). A total of 37 (51%) patients died, while the remaining 36 patients were alive at the end of the study. The causes of death were advanced cancer in 17 patients, hepatic failure in 15 patients, and renal failure in 5 patients. Two patients died within 1 year and therefore the survival data of only 71 (instead of 73) patients were used for the Kaplan-Meir survival analysis. The overall survival rates at 1, 2, and 3 years were 66%, 47%, and 36.4%, respectively [Figure 2].

Table 2 shows the comparison of background factors and results of univariate analysis using Cox proportional hazard model. The presence of associated features of portal hypertension (ascites, splenomegaly, etc.) did not have any significant effect on survival. The variables of Child's stage, AFP >1000ng/ml, size of the mass, and BCLC stage showed significant promise of association with mortality ($P$<.05) on univariate analysis [Table 2]. These variables were put in a stepwise multivariate Cox regression model, and the size of the mass at the start of the treatment emerged as the most significant independent predictor of survival [Figure 3].

With regard to assessment of local outcome, response could not be assessed in nine patients as they did not undergo follow-up CT scan. In the remaining 64 patients the response was as follows: (a) disease free - 20 patients [Figures 4 and 5], (b) recurrence - 2 patients, (c) fresh lesions - 10 patients, [Figure 6], (d) recurrence and fresh lesions - 3 patients, (e) residual disease - 17 patients [Figure 7], and (f) residual and fresh lesions - 12 patients.

## Discussion

TACE is the most widely used treatment option in patients with HCC who are unsuitable candidates for curative management.[9,22] The developing world has a peculiar epidemiological variation in terms of etiology and the stage of HCC at diagnosis; more than 80% of the HCC occurs in Asia and Africa.

In this study, HBV infection emerged as the most common background causal factor for HCC. This is consistent with the observations of published studies from other centers in India.[23-25] In contrast, in countries like Japan, Spain, etc., HCV-related HCC is predominantly encountered.[8,10,26] The majority of our patients were symptomatic at presentation (66/73 patients; 90.41%) and had a relatively large tumor size at the outset, indicating the presence of advanced disease. Treating these patients was very challenging. The largest published experience of TACE from Japan,[10] with a study population of 8510 patients, had subjects with smaller sized tumors (24% with <2 cm and 75% with <5 cm). Very few studies are available on the experience of TACE for relatively larger sized liver tumors (mean diameter approximately 7 cm).[8,13,27]

Doxorubicin, mitomycin, and cisplatin are the common antitumor drugs used alone or in combination during TACE. No standardized protocol exists with regard to the choice of the chemotherapeutic agent, dosage, dilution, rate of injection, and optimal re-treatment strategy. Similarly, there is no standard choice for the embolizing agent to be used or its quantity. In the present study, we used a combination of cisplatin (100 mg), doxorubicin (50 mg), and lipiodol (10–20 ml), followed by particulate embolization using gelatin sponge. The procedure was performed by cannulating the feeding artery superselectively (going as close to the tumor as possible using microcatheters), thus minimizing the risk of non-target embolization. This method of super selective cannulation has been identified as a favorable prognostic factor for the disease-free survival of patients following TACE.[11]

Our patients tolerated the procedure well. The commonly encountered minor complications post-procedure were

**Table 2: Distribution of background factors and results of univariate analysis in 71 patients with unresectable hepatocellular carcinoma who underwent Trans-arterial chemoembolization**

| Variables | N | Survival rate (%) | | | Hazards ratio (95% CI) | *P* value |
|---|---|---|---|---|---|---|
| | | 1 year | 2 year | 3 year | | |
| Age (years) | | | | | | |
| <50 | 34 | 61.0 | 46.0 | 34.4 | | |
| >50 | 37 | 70.1 | 48.0 | 39.7 | 0.86 (0.44-1.69) | 0.66 |
| Sex | | | | | | |
| Male | 67 | 65.1 | 47.0 | 36.4 | | |
| Female | 4 | 75 | - | - | 0.99 (0.23-4.17) | 0.99 |
| Child's score | | | | | | |
| A | 53 | 68.4 | 53.4 | 45.2 | | |
| B | 18 | 55.0 | 23.5 | - | 2.35 (1.12-4.93) | 0.02 |
| Etiology of cirrhosis | | | | | | Subset p |
| *HBV | 50 | 61.0 | 46.4 | 35.3 | | B vc C |
| *HCV | 11 | 86.0 | 26.0 | - | 1.02 (0.35-2.96) | 0.96 |
| Others | 10 | 77.1 | - | - | | |
| #AST (U/L) | | | | | | |
| <40 | 11 | 90 | 51.4 | - | | |
| >40 | 60 | 62.0 | 46.1 | 38.4 | 1.16 (0.44-3.02) | 0.77 |
| #ALT (U/L) | | | | | | |
| <40 | 23 | 67.1 | 30.2 | - | | |
| >40 | 48 | 66 | 54.0 | 45.2 | 0.56 (0.27-1.17) | 0.11 |
| **AFP (ng/ml) | | | | | | |
| <20 | 28 | 79.0 | 62.4 | 53.5 | | |
| 21-300 | 18 | 65.0 | 40.5 | 40.5 | 1.2 (0.49-2.96) | 0.69 |
| 301-1000 | 12 | 80.2 | 57.3 | 38.2 | 1.13 (0.40-3.23) | 0.82 |
| >1000 | 13 | 33.3 | 22.2 | - | 3.14(1.31-7.54)] | 0.01 |
| *Vascular involvement | | | | | | |
| Present | 13 | 64.8 | 41.7 | - | | |
| Absent | 58 | 66.4 | 47.8 | 39.4 | 1.21 (0.52-2.81) | 0.65 |
| Number of masses | | | | | | |
| Single | 33 | 71.2 | 49.6 | 43.4 | | |
| Multiple | 38 | 61.8 | 44.8 | 29.8 | 1.34 (0.67-2.68) | 0.4 |
| Size of mass | | | | | | |
| < 5 cm | 28 | 87.4 | 62.2 | 62.2 | | |
| >5-10 cm | 28 | 60.6 | 45.4 | 30.3 | | <0.001 |
| >10 cm | 15 | 29.5 | 14.8 | - | | |
| ##BCLC staging | | | | | | |
| A | 20 | | | | 2.01 (0.84-4.84) | 0.12 |
| B | 38 | | | | 1.64 (0.73-3.66) | 0.23 |
| C | 15 | | | | 3.47 (1.25-9.61) | 0.02 |
| Liver involvement by mass | | | | | | |
| >50% | 7 | 53.6 | 26.8 | - | | |
| <50% | 64 | 67.5 | 48.6 | 40.8 | 2.19 (0.83-5.74) | 0.10 |
| Portal hypertension | | | | | | |
| Present | 35 | 68 | 37.7 | 30.2 | | |
| Absent | 36 | 64.2 | 56.1 | 43.6 | 1.38 (0.69-2.75) | 0.36 |
| Liver size | | | | | | |
| Shrunken | 17 | 66.6 | 35.5 | 35.5 | | |
| Normal | 54 | 65.7 | 50.3 | 36 | 1.32 (0.63-2.77) | 0.46 |

*Vascular involvement: involvement of portal vein branches or inferior vena cava or hepatic veins, *HBV: Hepatitis B infection, HCV: Hepatitis C infection, #AST: Aspartate aminotransferase, #ALT: Aspartate aminotransferase, **AFP: Alpha-fetoprotein, ##BCLC staging: Barcelona clinic liver cancer staging

self-limiting and improved in about 5–7 days. Moreover, when a repeat session of TACE was performed in the same patients, we observed that the severity of the side effects was even less. About 13.7% of our patients developed deranged renal parameters, which possibly could be attributed to the use of the chemotherapeutic drug doxorubicin.

TACE is known to be a safe procedure with a low mortality rate and, further, the mortality has been decreasing over the last two decades (reportedly 10% in 1991, 1.1% in 1999, and 0.5% in 2006).[10,12,28] In the largest published experience of TACE, the various causes of death were as follows: hepatic failure (40.1%), cancer death (18.2%), and rupture of HCC.[10,15] We lost two patients within 1 month of performing the procedure due to hepatic and renal failure (one each), leading to a procedure-related mortality of 2.7%. We did

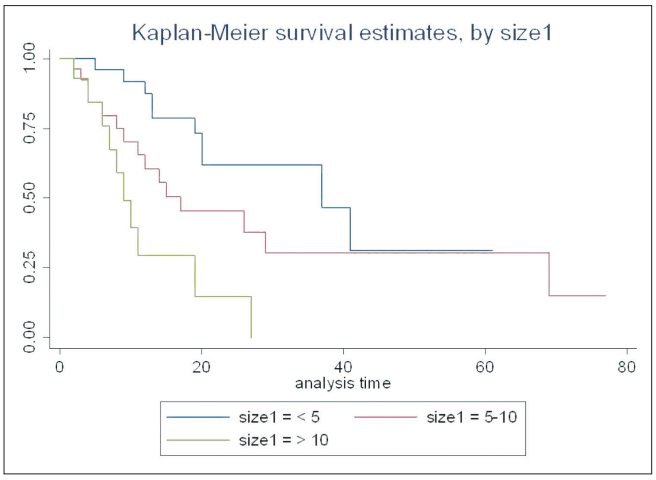


**Figure 3:** Kaplan-Meier survival curve shows the survival of patients of TACE with different sizes of the mass at the time of treatment. Patients with a tumor size of less than 5 cm (blue curve) have a longer survival period than those with a mass size of 5-10 cm (red curve) or more than 10 cm (green curve)

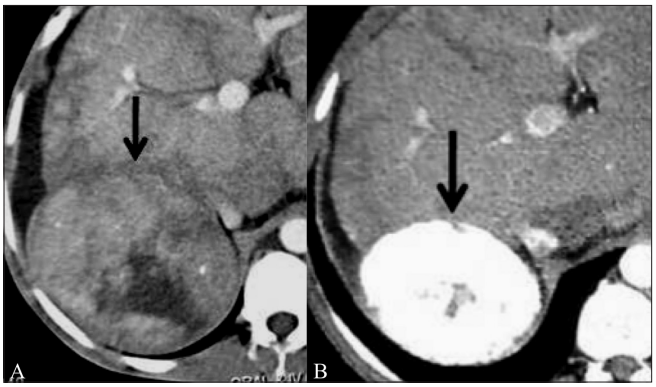


**Figure 5 (A,B):** Complete response in a patient with a large HCC, with cirrhosis due to hepatic vein outlet tract obstruction (BCLC-B). Arterial phase CT scan shows a large, exophytic, vascular HCC (10 cm) in segments 7 and 6 of the liver (arrow). TACE was done and a post-TACE CT scan at 1 year (B) showsreduction in tumor size; the tumor (arrow) is completely covered with Lipiodol, with no viable residual disease

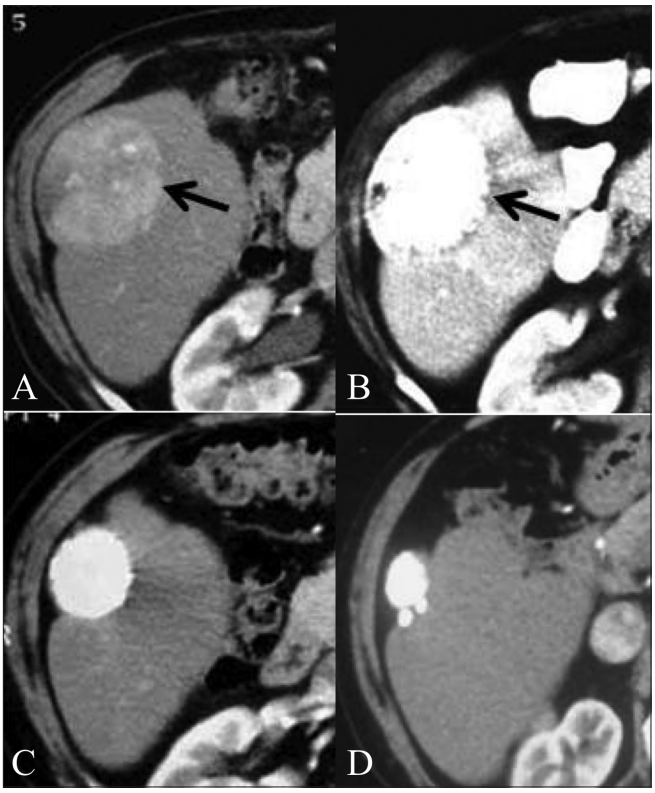


**Figure 4 (A-D):** Complete response following TACE in a patient of small HCC with chronic hepatitis B (BCLC-B). Pre-TACE arterial phase CT scan (A) shows a large enhancing surface tumor (arrow) in segment 6 of the liver. TACE was done. Post-TACE CT scan at 1 month (B) shows Lipiodol completely involving the tumor (arrow), with no enhancing residual viable tumor. Follow-up CT scans at 1 year (C) and 3 years (D), respectively, show marked tumor shrinkage, with retained Lipiodol and no residual or recurrent disease

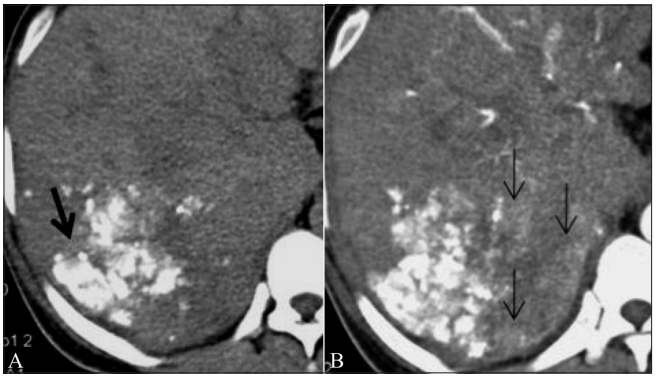


**Figure 6 (A,B):** Residual disease following TACE in a patient with a large HCC and HBV cirrhosis (BCLC-B). Post-TACE non-contrast CT scan (A) shows scattered patchy areas of retained Lipiodol (arrow) in the large HCC in segments 7/6 of the liver. Arterial phase CT scan (B) shows multiple areas of enhancing viable tissue (arrows) in the inferomedial aspect of the same mass, suggestive of residual disease

not encounter any case of rupture of HCC or infections following TACE as reported by other authors.[10,13]

There seems to be no consensus on the policy of subjecting patients to repeat sessions of TACE. Some centers perform repeat TACE at specific intervals, ranging from 2–3 months.[8,26,27] We performed repeat sessions of TACE based on the findings of follow-up CT done at 4 weeks post therapy. This policy was similar to that followed in the nationwide multicentric Japanese study by Takayasu *et al*.[10] It is known that the efficacy of TACE is better when the procedure is repeated on the basis of follow-up imaging findings rather than at pre decided scheduled intervals.[29]

Following TACE, significant tumor response is achieved in 17-61.9% of cases but complete tumor response is rare (0-4.8%) as the tumor cells may remain viable after the treatment of TACE.[30]

We were able to achieve complete response in 31.2% patients, while local disease progression in terms of

recurrence or development of fresh lesions was seen in 15/64 (23.4%) patients.

Efficacy of TACE for palliation of unresectable HCC has been demonstrated in several randomized controlled trials. The survival rate and the local response in our study were encouraging. The cumulative survival rate at 1, 2, and 3 years was 66%, 47%, and 36.4%, respectively. Table 3 shows the survival rates of different studies and it can be seen that the rates have been improving over the last two decades. The improved outcomes of HCC following TACE in the more recent studies may have a number of reasons, e.g., (a) the institution of screening programs for HCC, leading to detection of small tumors; b) the availability of better imaging techniques for diagnosis, i.e., modalities with high sensitivity and specificity such as multiphase CT scan and contrast-enhanced MRI); (c) stringent application of well-defined staging criteria for the disease; (d) clear-cut inclusion criteria, leading to homogenous study populations; (e) refinement in the technique of the procedure of TACE, e.g., the wide use of tiny microcatheters allows the catheter tip to be placed as distally as possible in the lumen resulting in better coverage of the tumor with the chemotherapeutic drugs.

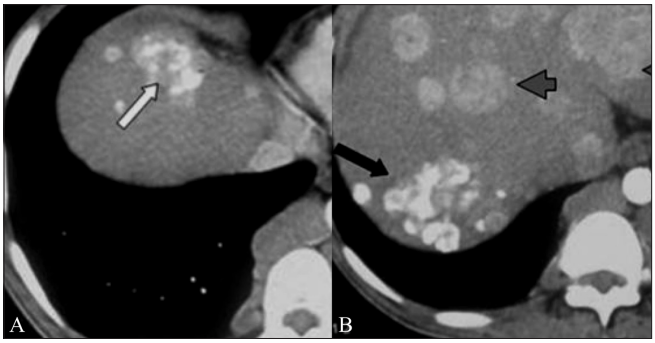


**Figure 7 (A,B):** Disease progression following TACE depicting poor response in a patient of mutifocal HCC with HBV cirrhosis (BCLC-C). Post-TACE contrast-enhanced CT scans at 1 month (A,B) show multifocal HCC in the right and left lobes of the liver. Only a few lesions are covered with Lipiodol (black arrow), while the remaining lesions are devoid of Lipiodol (white arrow), suggesting inadequate response. Additionally, multiple enhancing fresh lesions (small arrows in B) have also appeared, indicating progression of disease. This patient died 6 months post TACE

The overall survival rate in our study compares well[13,26] or is in fact better than that in many earlier studies from different countries.[26,31,32] Due to differences in the selection criteria, our study population probably had a larger tumor size and more advanced stage of disease. Developed countries have screening programs for HCC, which enable 'early detection and early treatment' and these countries therefore generally deal with patients with early-stage HCC.

Univariate analysis of the predictors for survival identified the Child-Pugh score, serum AFP >1000 ng/ml, BCLC stage, and tumor size as important variables affecting survival post TACE. All these above mentioned variables are basically interrelated and depict the advanced nature of the disease. The larger the tumor size, the higher the BCLC stage and the poorer the function of the underlying liver (Child's status). However, the presence of vascular invasion and associated portal hypertension did not show any significant effect on the overall survival. On multivariate analysis tumor size emerged as the single most important independent predictor of survival. This finding is similar to the observations made in other studies.[10,11]

Since the size of the mass is an important predictor for survival, this observation has grave implications in a country like ours where the majority of patients have large tumors at diagnosis. In India, screening programs for HCC are rare. For better treatment outcomes it is important to commence screening high-risk patients of cirrhosis to diagnose HCC at an early stage. Additionally, since HBV infection is the predominant cause for HCC, it would be highly desirable to institute preventive strategies for HBV infection, e.g., hepatitis B vaccination programs.

To conclude, TACE is a safe and efficacious palliative procedure. In India, the majority of patients have advanced disease at presentation. Despite the presence of large-sized

**Table 3: Survival rate following Transarterial chemoembolization in advanced hepatocellular carcinoma**

| | Study | No. of patients | Survival (%) | |
|---|---|---|---|---|
| | | | 1 year | 2 years |
| TACE (Gelfoam powder, doxorubicin [50 mg] | Pelletier *et al.*[29] (J Hepatol, 1990) | 21 | 24 | NR |
| TACE (Gelfoam particles, cisplatin [70 mg]) | Group d'Etude et de Traitment du Carcinome He´patocellulaire[22] (N Engl J Med, 1995) | 50 | 62 | 38 |
| TACE (Gelfoam, cisplatin [2 mg/kgl]) | Pelletier *et al.*[28] (J Hepatol, 1998) | 37 | 51 | 24 |
| TACE (1 Gelfoam, cisplatin [maximum 30 mg]) | Lo *et al.*[23] (HEPATOLOGY, 2002) | 40 | 57 | 31 |
| TACE (Gelfoam, doxorubicin [25–75 mg/m$^2$] | Llovet *et al.*[12] (Lancet, 2002) | 40 | 82 | 63 |
| TACE (Lipiodol, anticancer agent, gelatin sponge) | Takayasu *et al.*[21] (Gastroenterology 2006) | 8510 | 82 | 47 (3 years) |
| TACE (doxorubicin 50 mg, cisplatin 100mg, 10-20 ml of lipidol, gelfoam) | Present study | 71 | 60.8 | 34.4 |

NR: Not reported, Table modified from Llovet JM *et al.*[12]

tumors in our study population, TACE showed favorable local outcome and the survival rates were comparable with those reported by other authors. Initial tumor size was the most important independent predictor of survival in our patients of HCC.

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