PREDICTIVE FACTORS OF TRANS-ARTERIAL CHEMOEMBOLIZATION (TACE) EFFICACY FOR HEPATOCELLULAR CARCINOMA IN ARTERIAL PHASE COMPUTED TOMOGRAPHIC SCAN.

By:

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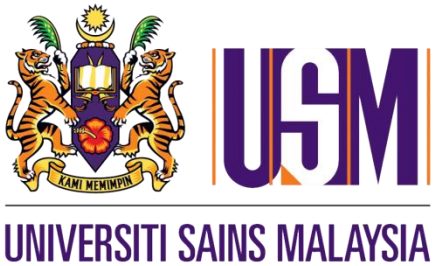
Dissertation Submitted in Partial Fulfillment of the Requirements for Master of Medicine (Radiology)



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LIST OF ABBREVIATIONS

TACE	Transarterial chemoembolization
HCC	Hepatocellular carcinoma
HU	Hounsefield Unit
HUSM	Hospital Universiti Sains Malaysia.
AP	Anterior-posterior diameter
WT	Width
PACS	Picture archiving and communication system
CT	Computed Tomography
ROI	Region of interest

ABSTRAK

Objektif: Tujuan kajian ini adalah (1) menganalisa faktor demografi pesakit yang didiagnosis dengan ketumbuhan hati yang menjalani prosedur TACE (2) mengenalpasti hubungan antara faktor ramalan (atenuasi, saiz dan lokasi ketumbuhan) dan tindakbalas ketumbuhan (isipadu baki ketumbuhan) kepada prosedur TACE (3) menentukan faktor ramalan yang menyumbang kepada tindak balas paling berkesan kepada prosedur TACE.

Metodologi: Pesakit yang didiagnosis dengan ketumbuhan hati yang menjalani prosedur TACE menggunakan 'drug eluting microparticles' di Jabatan Radiologi Hospital USM dan Hospital Selayang dikenalpasti. Imej CT scan 144 ketumbuhan sebelum dan selepas procedure TACE dianalisis berdasarkan beberapa parameter (atenuasi, saiz dan lokasi). Tindak balas ketumbuhan terhadap prosedur TACE dinilai berdasarkan pengurangan saiz ketumbuhan.

Keputusan: 144 ketumbuhan telah dianalisa dari CT scan dalam fasa arteri (*arterial phase*) sebelum dan selepas prosedur TACE. Analisis menggunakan 'simple linear regression' menunjukkan atenuasi dan saiz memberi hubungan yang signifikan dengan tindakbalas terhadap prosedur TACE ($P<0.001$). Tiada hubungan yang signifikan di antara lokasi ketumbuhan [ditengah atau ditepi ($P=0.453$) dan lobar kanan atau lobar kiri ($P=0.705$)] dengan tindakbalas terhadap prosedur TACE. Dari kedua-dua parameter yang signifikan, kami telah mendapati bahawa faktor ramalan yang paling berkesan terhadap prosedur TACE berdasarkan analisa 'multiple linear regression' adalah saiz ketumbuhan.

Kesimpulan: Saiz ketumbuhan yang kecil dan Hounsefield unit yang tinggi adalah faktor ramalan yang signifikan terhadap tindakbalas berkesan kepada prosedur TACE. Lokasi ketumbuhan tidak memberi hubungan yang signifikan terhadap tindakbalas yang baik kepada prosedur TACE secara statistik.

Kata kunci*: Ketumbuhan hati, TACE, CT scan dalam fasa arteri, Hounsefield unit, drug eluting microparticles.*

ABSTRACT

Objective: The aim of this study was (1) to evaluate demographic factors of patient with hepatocellular carcinoma who underwent TACE procedure (2) to identify the correlation between predictive factors (tumour attenuation, size and site of tumour) and response of tumour (volume of residual viable tumour) to TACE procedure (3) to determine which predictive factor contribute more to better tumor response to TACE.

Methodology: Patients diagnosed with Hepatocellular carcinoma who underwent TACE procedure using drug eluting microparticles as the embolized material recruited from PACS system at Radiology Department Hospital USM and Hospital Selayang. CT findings (pre and post TACE) of 144 tumors were analysed using several parameters (attenuation, size and site of tumour). Response of tumour to TACE was assessed based on reduction of size of tumour volume.

Results: A total of 144 nodules of HCC were analysed from pre- and post-TACE CT scan in arterial phase. Simple linear regression analysis revealed that tumour attenuation and size have significant association with the tumour response to TACE ($P<0.001$). There were no significant association found between the site of tumour [central or peripheral ($p=0.453$) and right lobe or left lobe ($P=0.705$)] with tumour response to TACE. Out of the two statistically significant variables, we found that the strongest predictive factor for better TACE response based on multiple linear regression analysis was the tumour size.

Conclusions: Smaller tumor and higher tumour attenuation (measured in Hounsfield unit) were the significant predictive factors for better tumour response to TACE. Location of the tumour showed no statistical significant association with better TACE response.

Keywords: *Hepatocellular carcinoma, TACE, arterial phase CT scan, Hounsefield unit, drug eluting microparticles.*

1. INTRODUCTION

& LITERATURE

REVIEW

1.1 INTRODUCTION & LITERATURE REVIEW

Hepatocellular carcinoma (HCC) is the commonest primary liver cancer. It accounts for 6% of all cancers worldwide and the fifth commonest cancer in the world (1). The incidence of HCC increases with the increasing number of cases of Hepatitis B and Hepatitis C infection worldwide.

In early stages cancer patient, the curative treatment is liver resection. A study by Zhang et al (2) mentioned that there is a 5-year survival rate of above 50% seen with liver resection of early stage cancer. Unfortunately, most of the patient presented with unresectable HCC due to late or advanced stages of disease. Thus, the treatments involve chemotherapy and/or radiotherapy.

Transarterial chemoembolization (TACE) is one of the therapeutic alternative treatments offered for the unresectable hepatocellular carcinoma. The rationale for TACE is based on the dual supply of the liver which is by hepatic artery and portal vein (3). The main blood supply to the HCC is by the hepatic artery. Thus in TACE, the targeted feeding artery will be embolized causing necrosis of the HCC while the non effected hepatic parenchyma will not be affected due to preserved portal blood supply. Hepatocellular carcinoma is a hypervascular tumour and the direct intraarterial infusion of chemotherapeutic agents with or without hepatic artery occlusion has resulted in improved tumour response rates compared with systemic IV chemotherapy (4).

There are several studies done previously to identify factors that affect response of HCC to transarterial chemoembolization. A study by Bryant M.K et al (5) demonstrated that peripherally located and small HCC tumours identified on pre-TACE computed tomography (CT) are more likely to experience complete or more than 90% tumour necrosis after TACE. Another study by Miraglia R et al (6) concluded that massive necrosis after TACE is more

common in the presence of tumour capsule, maximum diameter of the main lesion between 2 and 6cm, Cancer of the Liver Italian Programme (CLIP) score less than 2 and absence of constitutional syndrome. This study also mentioned that the ability to predict which patients will response to TACE may be useful in clinical decision making process. Katyal et al (4) found that there is a statistically significant correlation between hypervascular tumour on arterial phase CT and response to TACE. A study done by Imai N et al (7) to determine characteristic of HCC tumour that are associated with lower recurrence rate after TACE. In the study, the author found that increase in tumour density on CT scan one week after TACE is associated with significantly lower local recurrence rate, thus better response to TACE. Extent of tumour necrosis by histopathological examination had also been used by Kwan et al. (8) to determine tumour response to TACE. However, this study could not establish the significant correlation between imaging findings on pre-TACE CT and histopathological outcomes due to insufficient level of precision in CT imaging to differentiate between tumours to the same extent as in angiography (8).

Owing to the fact that TACE procedure is an invasive and high cost procedure, therefore it would be beneficial if pre-TACE CT scan assessment is done to help in deciding on which tumour should be chemoembolized. This study is to assess the predictive factors which are tumour attenuation, size of tumour and location of tumour in arterial phase CT with response of tumour to TACE procedure.

2. OBJECTIVES

OF STUDY

2.1 General objective:

The aim of this study is to predict the hepatocellular carcinoma response (volume of residual viable tumour) to trans-arterial chemoembolization (TACE) by assessing the attenuation of tumour, size of tumour and site of tumour in hepatic arterial phase CT scan.

2.2 Specific objectives:

1. To evaluate demographic factors of patient with hepatocellular carcinoma who underwent TACE procedure.
2. To identify the correlation between predictive factors (tumour attenuation, size and site of tumour) and response of tumor to TACE procedure.

   To determine which predictive factor which contributing more to better tumour response to TACE.

3. MANUSCRIPT

3.1 Title: Predictive Factors of Trans-arterial Chemoembolization Efficacy for Hepatocellular Carcinoma in Arterial Phase Computed Tomography Scan.

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3.2 Title: Predictive Factors of Trans-arterial Chemoembolization Efficacy for Hepatocellular Carcinoma in Arterial Phase Computed Tomography Scan.

3.2.1 Abstract

Background: The aim of this study was (1) to evaluate demographic factors of patient with hepatocellular carcinoma who underwent TACE procedure (2) to identify the correlation between the predictive factors (tumour attenuation, size and location of tumour) and response of tumor (volume of residual viable tumour) to TACE procedure (3) to determine which predictive factor contribute more to better tumour response to TACE.

Methodology: Patients diagnosed with Hepatocellular carcinoma in HUSM and Selayang Hospital who underwent TACE procedure using drug eluting microparticles as the embolic material were recruited. CT findings (pre and post TACE) of 144 tumours were analysed using several parameters (attenuation, size and site of tumour). Response of tumour to TACE was assessed based on reduction in tumour volume.

Results: A total of 144 nodules of HCC were analyzed from pre- and post-TACE CT scan in arterial phase. Simple linear regression analysis revealed that tumour attenuation and size have significant association with the tumour response to TACE ($P<0.001$). There were no significant association found between the site of tumour [central or peripheral ($p=0.453$) and right lobe or left lobe ($P=0.705$)] with tumour response to TACE. Tumour size was the strongest predictive factor for better TACE response based on multiple linear regression analysis.

Conclusions: Smaller tumour and higher tumour attenuation (measured in Hounsfield unit) were the significant predictive factors for better tumour response to TACE. Location of the tumour showed no statistical significant association with better TACE response.

Keywords: *Hepatocellular carcinoma, TACE, arterial phase CT scan, Hounsfield unit, drug eluting microparticles.*

3.3 Introduction

Hepatocellular carcinoma (HCC) is the commonest primary liver cancer. It accounts for 6% of all cancers worldwide and the fifth commonest cancer in the world (1). The incidence of HCC increases with the increasing number of cases of Hepatitis B and Hepatitis C infection worldwide.

In early stages cancer patient, the curative treatment is liver resection. A study by Zhang et al (2) mentioned that there is a 5-year survival rate of above 50% seen with liver resection of early stage cancer. Unfortunately, most of the patient presented with unresectable HCC due to late or advanced stages of disease. Thus, the treatments involve chemotherapy and/or radiotherapy.

Transarterial chemoembolization (TACE) is one of the therapeutic alternative treatments offered for the unresectable hepatocellular carcinoma. The rationale for TACE is based on the dual supply of the liver which is by hepatic artery and portal vein (3). The main blood supply to the HCC is by the hepatic artery. Thus in TACE, the targeted feeding artery will be embolized causing necrosis of the HCC while the non-effected hepatic parenchyma will not be affected due to preserved portal blood supply. Hepatocellular carcinoma is a hypervascular tumour and the direct intraarterial infusion of chemotherapeutic agents with or without hepatic artery occlusion has resulted in improved tumour response rates compared with systemic IV chemotherapy (4).

There are several studies done previously to identify factors that affect response of HCC to transarterial chemoembolization. A study by Bryant M.K et al (5) demonstrated that peripherally located and small HCC tumours identified on pre-TACE computed tomography (CT) are more likely to experience complete or more than 90% tumour necrosis after TACE. Another study by Miraglia R et al (6) concluded that massive necrosis after TACE is more

common in the presence of tumour capsule, maximum diameter of the main lesion between 2 and 6cm, Cancer of the Liver Italian Programme (CLIP) score less than 2 and absence of constitutional syndrome. This study also mentioned that the ability to predict which patients will response to TACE may be useful in clinical decision making process. Katyal et al (4) found that there is a statistically significant correlation between hypervascular tumour on arterial phase CT and response to TACE. A study done by Imai N et al (7) to determine characteristic of HCC tumour that are associated with lower recurrence rate after TACE. In the study, the author found that increase in tumour density on CT scan one week after TACE is associated with significantly lower local recurrence rate, thus better response to TACE. Extent of tumour necrosis by histopathological examination had also been used by Kwan et al. (8) to determine tumour response to TACE. However, this study could not establish the significant correlation between imaging findings on pre-TACE CT and histopathological outcomes due to insufficient level of precision in CT imaging to differentiate between tumours to the same extent as in angiography (8).

Owing to the fact that TACE procedure is an invasive and high cost procedure, therefore it would be beneficial if pre-TACE CT scan assessment is done to help in deciding on which tumour should be chemoembolized. This study is to assess the predictive factors which are tumour attenuation, size of tumour and location of tumour in arterial phase CT with response of tumour to TACE procedure.

3.4 Methodology

The aim of this study was to predict the hepatocellular carcinoma response to trans-arterial chemoembolization (TACE). Patients diagnosed with Hepatocellular carcinoma from HUSM and Selayang Hospital who underwent TACE procedure using drug eluting microparticles as the embolic material were recruited from Picture Archive Communication System (PACS). The CT findings (pre and post TACE) of tumours were analysed using several parameters (Hounsfield unit, tumour size and tumour location). Tumour response to TACE was assessed base on reduction of the tumour volume.

This study was a cross sectional study conducted at Hospital Universiti Sains Malaysia, Kelantan and Selayang Hospital. Data were collected from Picture Archive Communication System (PACS). The ethical approval was obtained from Human Research Ethics Committee of Universiti Sains Malaysia (JEPeM USM Code USMKK/PPP/JEPeM/15070260] which complies with the Declaration of Helsinki and from National Medical Research Register [(NMRR-16-1125-30175(IIR)].

The inclusion criteria were patients diagnosed with hepatocellular carcinoma subjected for TACE using drug eluting microparticles as the embolic material and had pre- and post- TACE CT scan. The exclusion criterion was TACE using oil-based radio-opaque contrast agent as the embolized material.

By using Epicalc 2000 Software (using 95% confidence interval of ±5% precision to detect 80.1% mean percentage reduction of viable tumour volume), a total of 144 tumour were recruited. This calculation was based on previous study by Bargellini et al (9).

3.4.1 CT Scan Technique and TACE technique:

All patients underwent pre-TACE CT scan examinations using a Siemen CT scanner 128 slices. Multiphases CT Liver performed using a 5mm thick sections and a 1mm to 5mm intersection gap. Each patient received 60 – 80mls of intravenous (IV) contrast media via a mechanical power injector. The IV contrast material was injected at the rates of from 2.5 to 4.0 mL/sec. Arterial phase scan was acquired at 30 second post injection. Hepatocellular carcinoma was defined as mass within the liver parenchyma which demonstrates early arterial enhancement and contrast washout in portal venous phase. Images were then transferred to PACS.

TACE procedure was carried out through cannulation of coeliac artery, common hepatic artery and hepatic artery branches via femoral artery catheterization with a 5-French angiography catheter (eg:Yashiro catheter). Angiographic images were acquired during contrast injection. This was followed by cannulation of the arterial feeder with microcatheter through which the chemoembolic agent (drug eluting microparticle and 75mg Doxorubicin) was delivered. Images were then transferred to the PACS.

CT scan was performed 6 weeks after the embolization to assess the tumour response. Data of pre- and post-TACE CT scan study in arterial phase were collected from PACS in HUSM and Selayang Hospital.

3.4.2 Data Collection

All the necessary data were retrieved from the PACS. The images were transferred into the Osirix system 3.2.1 version in an Apple MAC PRO PC with 2.66 GHz Dual Core Intel Xeon processor as the diagnostic viewing workstation. The monitor used for this work-

station was Apple Cinema HD Display (23" Flat Panel) with optimum resolution of 1920 x 1200. Volumetric analysis was performed using the Osirix software by a single observer (researcher) who underwent a validation test by a well-trained Radiologist.

The measurement of tumour volume in pre-TACE arterial phase CT images and the volume of residual viable tumour in post-TACE arterial phase CT images were taken using OSIRIX software ver.3.2.1.

The independent variables were age, gender, Alpha-feto protein level, Hepatitis B status, Hepatitis C status, Child Pugh Score, tumour attenuation [mean lesion enhancement on CT in Hounsfield units (HU) was measured in the following manner. A circular region of interest (ROI) for each lesion was drawn to encompass the longest dimension of the tumour on contrast-enhanced CT imaging (7)], location [right lobe or left lobe; and peripheral or central location which was determined by labeling the tumour that was located at less or equal to 1cm from the periphery as peripherally located tumour and the rest were labelled as central] and size of tumour [in width and anteriorposterior diameter]. The dependent variable was tumour volume.

To maintain patient's privacy and confidentiality, the collected data were labelled as anonymous with numbers in the data collection sheet.

3.4.3 Data Analysis

Quantitative data were analysed using Microsoft® Office Excel and Statistical Product and Service Solutions (SPSS) for Windows, SPSS Inc.© (version 18, SPSS Inc., Chicago, IL,USA). Continuous variables are expressed as mean ± S.D or median (interquartile range, IQR) and categorical variables as percentages. The student's and paired-sample t-tests were performed if normality was demonstrated by histogram.

Otherwise, non-parametric tests (Mann-Whitney U or Wilcoxon signed rank tests) were used. Chi-square test was used to compare the categorical variables. All statistical tests were considered significant when the two-sided *p* value was < 0.05. Simple linear regression and multiple linear regression analysis were used to analyze the predictive factors and tumour response to TACE.

3.5 Results

3.5.1 Demographic data.

A total of 144 nodules were chosen from selected patients. The mean age of the study subjects were 61±7 years-old (SD: 7.1) (Table 1). Majority of the study subjects were male 86.1% while female comprised of 13.9 %. Thirteen point nine percent had hepatitis B and 70.8% had hepatitis C. Mean AFP level of study subjects were 1459.19±3577.83 µg/L. The Child Pugh score of the study subjects were of A (66%) and B (34%).

Table 2 shows the analysis of the subject demographic data according to the two different types of infection. For disease caused by Hepatitis B virus, the mean age of the study subjects was 61±7 years-old with minimum and maximum ages of 45 and 79, respectively. For disease caused by Hepatitis C virus, the mean age of the study subjects was 61±7 years-old with minimum and maximum ages of 41 and 79, respectively. There was no significant difference between the mean ages of the two groups. Subjects with Hepatitis B virus infection comprised 11.9% female and 88.1% male; while that of Hepatitis C virus infection consisted of 14.7% female and 85.3% male. There was no significant difference in the distribution of gender between these two study groups. There were also no significant difference between ALP levels for subjects with Hepatitis B (1185.69±2581.46 µg/L) and

Hepatitis C (1571.81±3921.10 µg/L) infections. Similarly, no significant difference found between distribution of Child Pugh score of subjects with Hepatitis B and Hepatitis C (Table 2).

3.5.2 Correlation between predictive factors (tumour attenuation, size and site of tumour) and tumour response to TACE procedure.

3.5.2.1 Correlation between tumour attenuation and size and tumour response to TACE (Table 3)

In Pearson correlation analysis on association between tumour attenuation and tumour size and response of tumour to TACE, HU revealed strong positive correlation ($r=0.740$, $p<0.05$) with the treatment response; while tumour size of AP and width showed moderate negative correlations (i.e. $r=-0.405$, $p<0.05$; $r=-0.491$, $p<0.05$, respectively) with treatment responses.

3.5.2.2 Comparison response of tumour to TACE attributed to site of tumour

There was no significant difference in treatment responses of subjects with different site of tumours. (Table 4)

3.5.3 Simple linear regression analysis on predictive factors associated with response of tumour to TACE (Table 5)

Predictive factors contribute to better tumour response to TACE were analysed by simple linear regression. Among the analysed predicting factors i.e. HU, AP, width, intra-lobe location and site of liver lobe, only the first three variables (HU, AP, width) revealed significant association with the tumour response to TACE. For HU, an increase of each HU

was associated with an increase of 0.682 treatment response percentage. For AP, an increase of each AP unit was associated with a decrease of 3.852 treatment response percentage. For width, an increased of each width was associated with a decreased of 5.532 treatment response percentage. There was no significant association found between the tumour location and tumour response to TACE.

3.5.4 Multiple linear regression analysis on predictive factors associated with response of tumor to TACE (Table 6)

Predictive factors significantly associated with tumour response to treatment were then analyzed by multiple linear regression. After adjustment with the tumour size, i.e. width, an increase of each Hounsfield unit was associated with an increase of 0.596 treatment response percentage. On the other hand, an increase of each WT unit was associated with a decrease of 2.707 treatment response percentage.

3.6 Discussion

Transarterial chemoembolization (TACE) is a therapeutic alternative treatments offered for the unresectable hepatocellular carcinoma. The aim of TACE is to occlude the blood supply to the tumour as well as delivering chemotherapy drugs to the tumour.

This study focused on the use of arterial phase CT scan to assess the enhancement, size and location of hepatocellular carcinoma to predict which patients would obtain the most benefit from transarterial chemoembolization. We assessed the TACE response by measuring percentage of tumour reduction by comparing the pre and post TACE CT scan in arterial phase.

Previous study by Yamashita et al. (10) found that hypovascular tumours showed less response to transarterial chemoembolization (TACE). This is supported by another study done by Katyal et al. (4) which concluded that hypervascular tumour shows better response to TACE. From our study, two out of the three variables that were analysed showed statistically significant findings. The first variable that was analysed was the Hounsfield unit (HU) of the lesion in the arterial phase CT of liver. We found that lesions with higher enhancement (increasing HU) were showing significantly better response to transarterial chemoembolization. Generally, HCC receives its blood supply from hepatic artery. Increase in attenuation of the tumor signifies hypervascularity of the lesion. Findings in our study support the proposal that tumor with more enhancement has better blood supply hence more likely to take up embolic material and develop necroses.

The second variable that was assessed was the size of tumour in the AP (Anterioposterior) diameter and the width. Based on this study, it was shown that size of the lesion affects the outcome of TACE. We found that lesions with smaller size (both in AP diameter and width) showed better response to TACE. This is likely due to lesser area to

tackle during TACE procedure and ample amount of chemo drugs concentrated within the smaller size tumour and hence better response. This finding is similar to previous study by Bryant MK et al. (5) in which they found that smaller tumour size were significantly associated with favourable response to TACE whereby complete or more than 90% tumor necrosis was achieved.

The third variable which was location of the tumour showed no significant association with TACE response. Lesions location either in the right lobe, left lobe, at the center or periphery of liver proved no statistically significant findings. These findings were not in line with the previous study done by Bryant MK et al. (5) in which they found that peripherally located tumour was more likely to experience more tumour necrosis after TACE. This could be explained by slight modification technique done in our study whereby we classified tumour that was located at less or equal to 1cm from periphery as peripherally located tumour and the rest were labelled as central. However, the previous study done by Bryant MK et al. (5) labelled tumour as peripheral if located greater than 4cm from the portal vein bifurcation and centrally located tumour if within 4cm of the portal vein bifurcation. There was no previous study done comparing right and left lobe of liver as tumour location.

Out of the two statistically significant variables, we found that the strongest predictive factor for better TACE response based on multiple linear regression analysis was the tumour size. Our study demonstrated that with increase of each Hounsfield unit associated with an increased of 0.596 treatment response percentage. On the other hand, an increase of size (width) was associated with a decreased of 2.707 treatment response percentage.

This study is clinically important because tumour size and Hounsfield unit are easily obtained from CT imaging. Selection of tumour which is small and shows better enhancement as compared to bigger tumour can be decided from CT scan itself.

In conclusion, we demonstrate a smaller tumour size and higher Hounsfield unit as the significant predictive factors for better tumour response to TACE. This might help in the patient's management and selection for treatment method or procedure.

3.7 Conclusion:

Smaller tumor size and higher Hounsfield unit are the significant predictive factors for better tumour response to TACE. Location of the tumour shows no statistical significant association with better TACE response.

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3.9 TABLES AND FIGURES

Table 1: Demographic data (n=144)

Variable	Value
Age, year	
Mean	61.2
SD	7.1
Min	41
Max	79
Gender, n (%)	
Female	20 (13.9)
Male	124 (86.1)
Hepatitis status, n (%)	
B	42 (29.2)
C	102 (70.8)
Alpha feto protein level (µg/L)	
Normal (<7), n (%)	-
Abnormal (>7), n (%)	144 (100)
Abnormal (7-500), n (%)	77 (53%)
Suggestive of hepatoma (>500), n (%)	67 (47%)
Child Pugh Score, n (%)	
A	95 (66.0)
B	49 (34.0)
C	-

Table 2: Demographic data of study subjects according to different types of hepatitis infection

Variable	Types of Infection		P value
	Hepatitis B	Hepatitis C	
Age			0.965[a]
Mean	61.2	61.2	
SD	6.7	7.3	
Min	45	41	
Max	79	79	
Gender, n (%)			0.659[b]
Female	5 (11.9)	15 (14.7)	
Male	37 (88.1)	87 (85.3)	
Alpha feto protein level (µg/L)	1185.69 (2581.46)	1571.81 (3921.10)	0.558[a]
Normal (<7) , n (%)	-	-	
Abnormal (>7) , n (%)	42 (100)	102 (100)	
Abnormal (7-500), n (%)	20 (48)	57 (56)	0.366[b]
Suggestive of hepatoma (>500) , n (%)	22 (52)	45 (44)	
Child Pugh Score, n (%)			0.357 [b]
A	30 (71.4)	65 (63.7)	
B	12 (28.6)	37 (36.3)	
C	-	-	

Note: [a]independent t-test, [b]chi-square test for homogeneity