Journal of Pain Research

Dovepress
open access to scientific and medical research

Open Access Full Text Article

ORIGINAL RESEARCH

Health education helps to relieve postembolization pain during hepatic arterial chemoembolization therapy

This article was published in the following Dove Press journal:
Journal of Pain Research

Zi Xuan Wang[1]
Lin Li[1]
Feng Ying Tao[2]

[1]Department of Interventional Radiology, Qingdao Municipal Hospital, Qingdao, Shandong, People's Republic of China; [2]Department of Oncology, Qingdao Municipal Hospital, Qingdao, Shandong, People's Republic of China

Journal of Pain Research downloaded from https://www.dovepress.com/
For personal use only.

Aim: Psychological intervention has been proved a complementary approach to drug analgesia. Another study suggested that health knowledge is associated with psychological symptoms in patients with liver cancer. This study is conducted to assess whether improving the health education (HE) alleviates the postembolization pain during transarterial chemoembolization (TACE).

Materials and methods: One hundred and fifteen patients, who required TACE for hepatocellular carcinoma (HCC) and suffered postembolization pain, were randomized into control group (n=63) and HE group (n=52). The health knowledge was scaled with the health knowledge questionnaire (HKQ). The postembolization pain was scored using a 0–10 numeric rating scale (NRS-10) after arterial embolization in both groups.

Results: There were no statistical differences between male and female in all HKQ scores ($P>0.05$). The HKQ scores of young people (≤45 years old) were significantly higher than those of elders (>45 years old; $P<0.05$). After teaching HE, the HKQ scores were significantly increased in patients of the HE group ($P<0.01$). The postembolization pain score in the HE group was significantly lower than that in the control group ($P<0.05$). The HKQ scores of question 1, 3, and total were negatively correlated with the pain score in this sample ($P<0.05$).

Conclusion: Improving the HE among HCC patients before TACE is beneficial for the pain relief during interventional procedure.

Keywords: liver neoplasms, radiology, health education, non-pharmacological, pain

Introduction

Hepatocellular carcinoma (HCC) is the fifth most common malignancy in males and the seventh in females, representing the third leading cause of cancer death worldwide.[1] In 2010, there were 358,840 new cases of liver cancer in China and 312,432 deaths from the disease.[2,3] Liver transplantation and resection are the only potentially curative treatments; however, only a small proportion of patients are eligible for these therapies.[4,5] Transarterial chemoembolization (TACE) is indicated as the primary palliative therapy of choice for patients with unresectable liver cancer.[6,7] A large number of studies have confirmed that TACE controls tumor progression and prolongs survival.[8,9] However, TACE is often accompanied by postembolization syndrome (PES), a clinical syndrome defined by fever and right upper quadrant abdominal pain with or without nausea and vomiting. Zhou et al[10] reported that 75% of patients undergoing TACE experienced severe pain, and 93% of patients required opioid treatment during the first 12 hours after TACE. Several analgesics, such as oxycodone and parecoxib sodium, have been required to alleviate the postembolization pain.[10,11] Despite the

Correspondence: Feng Ying Tao
Department of Oncology, Qingdao Municipal Hospital, No.1 Jiao-Zhou Road, Qingdao, Shandong 266000, People's Republic of China
Tel +86 532 8278 9228
Fax +86 532 8282 7158
Email prince_room@sina.com

submit your manuscript | www.dovepress.com
Dovepress
http://dx.doi.org/10.2147/JPR.S166333

© 2018 Wang et al. This work is published and licensed by Dove Medical Press Limited. The full terms of this license are available at https://www.dovepress.com/terms.php and incorporate the Creative Commons Attribution – Non Commercial (unported, v3.0) License (http://creativecommons.org/licenses/by-nc/3.0/). By accessing the work you hereby accept the Terms. Non-commercial uses of the work are permitted without any further permission from Dove Medical Press Limited, provided the work is properly attributed. For permission for commercial use of this work, please see paragraphs 4.2 and 5 of our Terms (https://www.dovepress.com/terms.php).

good adjuvant analgesic effect on post-TACE pain, there are still a fraction of patients who are not sensitive to analgesic medications or suffer from side effects. It is, therefore, necessary to develop non-pharmacologic approaches to improve the patient's painful experience.

A large number of studies indicated that severe psychological distress occurs in liver cancer patients,[12] especially in patients with hepatic malignancy before interventional procedures.[13,14] A former study demonstrated that psychological interventions, including encouragement, verbal suggestion, relaxation training, distraction, therapeutic touch, guided imagery, and intra-arterial placebo, can relieve postembolization pain during hepatic arterial chemoembolization therapy. [13] Another subsequent study suggested that health knowledge is associated with psychological symptoms in patients with liver cancer.[14] Lack of health knowledge could lead to psychological stress directly.[15,16] Therefore, what is the relationship between health knowledge and postembolization pain in patients with liver cancer?

To elucidate this key point, we conducted a prospective, randomized controlled study involving a series of HCC patients who were scheduled for TACE. The aim was to assess whether improving the health education (HE) among HCC patients before TACE alleviates the postembolization pain during interventional procedure.

Materials and methods

Study subjects

In the period of 64 months from April 2010 to July 2015, 150 patients with unresectable HCC were referred to the interventional radiology department for TACE and agreed to take part in the trial.

Patient inclusion criteria were as follows: 1) adult patients aged 18 years or older; 2) the diagnosis of HCC was confirmed by imaging, elevated serum tumor markers, or pathologic and histological examination according to the diagnostic criteria for HCC established by the National Association for the Study of Liver Cancer[17]; 3) Barcelona Clinic Liver Cancer (BCLC) stage A–C (except portal vein occlusion)[18]; 4) suffering from right upper quadrant abdominal pain after TACE procedure.

Patient exclusion criteria included 1) history of interventional diagnosis and/or therapy; 2) bellyache before embolization; 3) treatment with anxiolytic or narcotic analgesics 72 hours prior to the therapy; and 4) the presence of encephalopathy or other significant alterations of mental status or cognitive impairment or visual and auditory deficits.

Randomization

The subjects were randomly assigned to the HE group or control group according to random numbers from 1 to 150, generated by Research Randomizer (http://www.randomizer.org). One researcher was assigned to perform the protocol with the random allocation schedule and issue envelope encapsulation HE plan to patient's responsible nurse. The nurses opened the envelopes to determine the following assignment and carried out the program in ward. Other researchers in the interventional radiology theater were blind to the assignment until the time of patient enrollment.

HE

HE of disease and related treatment was a routine requirement before interventional procedure in the hospital. According to the standard protocol, patients in the HE group were evaluated with health knowledge questionnaire (HKQ) on admission, taught of HE for about half an hour, and evaluated with HKQ once more on the same day before TACE in the ward. Patients in the control group were also evaluated with HKQ on admission, did not accept HE before TACE, and received rescue HE after TACE procedure. The HE curriculum consists of five critical issues, ie, diagnoses of liver cancer, symptoms of liver cancer, interventional therapy (TACE), post-TACE nursing care, and prognosis of liver cancer. The teaching of HE was performed by three experienced nurses who had accepted a special training before the study.

Outcome measures

Health knowledge was assessed with HKQ, a questionnaire created for HCC patients before interventional procedure.[14] The HKQ consists of patient's name, ID, and five questions defining a total score from 0 to 10 (Table 1). Every answer is evaluated and rated on a scale of 0–2: "0", do not know; "1", knows but the answer is incomplete; and "2", know and the answer is complete.

Table 1 Health knowledge questionnaire

	Question	Score
Question 1	What disease do you suffer from?	0–2
Question 2	What symptom of this disease do you know?	0–2
Question 3	How to cure the sickness?	0–2
Question 4	How to care yourself after interventional therapy?	0–2
Question 5	How about the prognosis of this disease?	0–2
Total		0–10

The postembolization pain was scored using a 0–10 numeric rating scale (NRS-10)[19] ("0", no pain at all; "1–3", mild pain; "4–6", moderate pain; "7–9", severe pain; and "10", unbearable pain) after arterial embolization during interventional procedure in both groups.

Data collection

Several researchers were trained by the research coordinator in HE and other details related to survey prior to the study. Another two researchers were trained in assigning HKQ and NRS-10 scores related to the outcome assessment before data collection. During the scoring procedure, the researchers were blind to the group allocation. All patients were guided to complete the HKQ under the full supervision of the nurse in ward and to indicate the magnitude of postembolization pain on a "pain thermometer" during TACE procedure with the uniform advices. The thermometer scale was then translated into an NRS score. Data collection efforts for all outstanding data forms were ceased 6 months after the last required patient file was completed (Figure 1).

The degree of hepatic dysfunction was calculated by Child–Turcotte–Pugh (CTP) classification. Cancer stage was determined using the BCLC staging System.[20] Patients' baseline characteristics, including demographic information (ie, age and gender), diagnosis, etiology, CTP class, BCLC stage, and HKQ scores were collected from the medical records or assessed by the researcher. Post-HE HKQ and NRS-10 scores were assigned blindly by two researchers, ie, they were unaware of any demographic and clinical data of the patients. All data were recorded and entered into SPSS software for analysis (SPSS Inc., Chicago, IL, USA).

Statistical analysis

The values measured as continuous data were divided into binary categorical variables to make the prediction rule clear. The cutoff point between the young adults and elderly were set at 44 years for age. The measurement data were expressed as mean ± SD and the enumeration data as proportions. Statistical analysis of the difference between two means of continuous variables was tested using the independent samples or paired-samples Student's *t*-test. The Pearson chi-squared test was used to compare the categorical variables. The relationship between HKQ score [pre-TACE score in the control group and post-HE score in the HE group] and

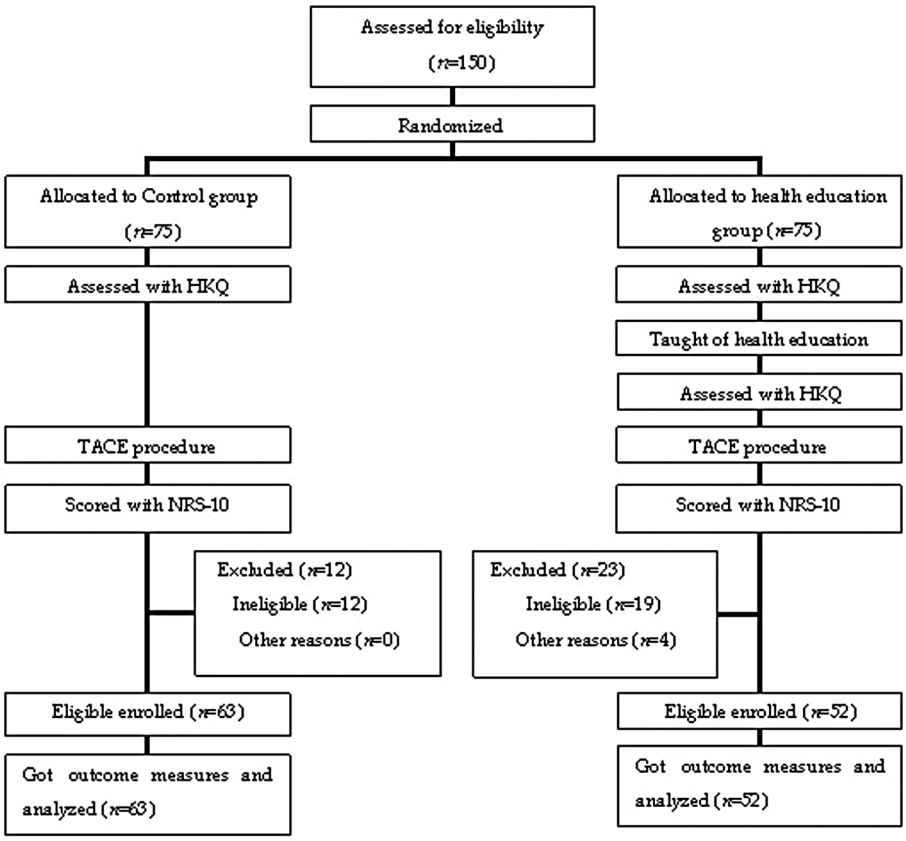


Figure 1 Study flow diagram.
Abbreviations: HKQ, health knowledge questionnaire; NRS-10, 0–10 numeric rating scale; TACE, transarterial chemoembolization.

postembolization pain score was evaluated with the Pearson correlation coefficient. A *P*-value of ≤0.05 was considered statistically significant for all analyses. SPSS (version 15.0 for Windows) was used to perform all statistical analyses.

Ethics statement

The study was approved by the clinical trial ethics committee/institutional review board (IRB) at Qingdao Municipal Hospital (Qingdao, People's Republic of China), and all patients provided written informed consent.

Results

Baseline characteristics

One hundred and fifteen patients were included in this study. Overall, there were 86 men (74.78%) and 29 women (25.22%), and age ranged from 34 to 76 years (51.07±11.153 years). The most common causative factors were hepatitis B (95.65%, n=110). CTP class A or B disease was present in 53.04% (n=61) and 46.96% (n=54) of cases, respectively. Detailed patient demographics, disease characteristics, staging, and HKQ score at the time of initial presentation in the HE group and the control group are shown in Table 2. Both groups were similar in age, gender, etiology, CTP class, BCLC stage, and HKQ score (*P*>0.05; Table 2).

HKQ score of HCC patient

The HKQ total score in all HCC patients was 7.25±2.527 at initial evaluation. The mean scores of question 1, 5, 4, 2, and 3 (1.79, 1.53, 1.49, 1.30 and 1.15, respectively) decreased successively. When male and female patients were compared, there were no statistical differences in all scores (*P*>0.05). Notably, the HKQ scores of young people (≤45 years old) were significantly higher than those of elders (>45 years old; *P*<0.05; Table 3).

Effect of HE on patients

After teaching the HE, all HKQ scores were significantly increased in patients of the HE group (pre-HE scores vs post-HE scores, *P*<0.01). Likewise, the majority of the post-HE HKQ scores in the HE group were visibly higher than those pre-TACE HKQ scores in the control group (*P*<0.05) except score of question 4 (*P*=0.05; Table 4).

Correlation between NRS-10 score and HKQ score

The postembolization pain numerical rating score (NRS-10) in the HE group (mean=5.40, SD=1.829) was significantly lower than that in the control group (mean=6.13, SD=1.988; *t*=2.013, *P*=0.047<0.05). The Pearson correlation analyses revealed that the HKQ scores of question 1, 3, and total were

Table 2 Baseline characteristics of patients

Characteristics	Control group (n=63)	HE group (n=52)	Significance	
			Statistics	*P*-value
Age (years)	49.37±11.169	53.13±10.884	*t*=1.822	0.071
Gender, n (%)				
Male	46 (73.02)	40 (76.92)	χ^2=0.231	0.631
Female	17 (26.98)	12 (23.08)		
Etiology, n (%)				
Hepatitis B virus	61 (96.83)	49 (94.23)	χ^2=0.048	0.826
Others	2 (3.17)	3 (5.77)		
CTP class, n (%)				
A	34 (53.97)	27 (51.92)	χ^2=0.048	0.827
B	29 (46.03)	25 (48.08)		
BCLC stage, n (%)				
A	22 (34.92)	14 (26.92)	χ^2=1.251	0.535
B	36 (57.14)	35 (67.31)		
C	5 (7.94)	3 (5.77)		
HKQ score				
Question 1	1.81±0.592	1.75±0.653	*t*=0.512	0.609
Question 2	1.30±0.463	1.29±0.457	*t*=0.152	0.879
Question 3	1.21±0.722	1.08±0.763	*t*=0.933	0.353
Question 4	1.56±0.713	1.40±0.774	*t*=1.092	0.277
Question 5	1.59±0.816	1.46±0.896	*t*=0.787	0.433
Total	7.46±2.481	6.98±2.570	*t*=1.015	0.312

Note: *P*>0.05 for each comparison.
Abbreviations: BCLC, Barcelona Clinic for Liver Cancer; CTP, Child–Turcotte–Pugh; HE, health education; HKQ, health knowledge questionnaire.

Table 3 Health knowledge scores scaled with HKQ before intervention in 115 patients

HKQ	n	Score	Significance	
			t (or *t*′)	*P*-value
Question 1	115	1.79±0.614		
Gender				
Male	86	1.79±0.616	0.018	0.986
Female	29	1.79±0.620		
Age (years)				
≤45	42	1.98±0.154	3.368[a]	0.001
>45	73	1.67±0.746		
Question 2	115	1.30±0.458		
Gender				
Male	86	1.28±0.451	0.667	0.506
Female	29	1.34±0.484		
Age (years)				
≤45	42	1.48±0.505	3.134[a]	0.003
>45	73	1.19±0.396		
Question 3	115	1.15±0.740		
Gender				
Male	86	1.20±0.733	1.246	0.215
Female	29	1.00±0.756		
Age (years)				
≤45	42	1.48±0.634	3.816	0.000
>45	73	0.96±0.735		
Question 4	115	1.49±0.742		
Gender				
Male	86	1.53±0.698	1.080[a]	0.286
Female	29	1.34±0.857		
Age (years)				
≤45	42	1.67±0.612	2.139[a]	0.035
>45	73	1.38±0.793		
Question 5	115	1.53±0.851		
Gender				
Male	86	1.49±0.878	0.912	0.364
Female	29	1.66±0.769		
Age (years)				
≤45	42	1.95±0.309	5.426[a]	0.000
>45	73	1.29±0.964		
Total score	115	7.25±2.527		
Gender				
Male	86	7.29±2.501	0.280	0.780
Female	29	7.14±2.642		
Age (years)				
≤45	42	8.55±1.329	5.398[a]	0.000
>45	73	6.49±2.739		

Note: [a]Equal variances not assumed, *t*′ test.
Abbreviation: HKQ, health knowledge questionnaire.

negatively correlated with the postembolization pain NRS-10 score in total sample ($P<0.05$; Table 5).

Discussion

Hepatic malignancy is the fastest growing cause of cancer-related mortality and has a poor prognosis with 5-year survival rates of less than 12%.[21] TACE, as an important treatment for HCC, has been proved effective in improving overall survival rate.[22] Therefore, it is recommended by the American Association for the Study of Liver Diseases (AASLD) and other international guidelines as the treatment of choice for patients with advanced, unresectable HCC.[7,23–25] Based on this, it is estimated that more than 100,000 TACE procedures are performed in China each year.[10] Although TACE has been demonstrated to be safe with low rates of severe complications,[5,26–28] PES, especially the right upper quadrant abdominal pain, still appears to be a common complication.[29–31] To reduce the postembolization pain during TACE procedure, we focus on the non-pharmacologic approaches complementing the drug analgesia in recent decade. In this study, we hypothesized that there was a correlation between HE and postembolization pain in HCC patients.

Baerlocher et al[32] reported that only 6% of patients had heard of the field of interventional radiology before their referral (despite 21% having undergone a procedure previously). Before their arrival in the interventional radiology department, 87% had not received any information about interventional radiology. In our study, the HKQ score of question 3 in all patients arrived 1.15±0.740 (full scores=2) at initial evaluation. It is visibly better than Baerlocher's result in Canada, but the score of question 3 is still the lowest one of all five scores in HKQ. The HKQ scores of young people (≤45 years old) were greatly higher than that of the elders (>45 years old) in all questions and total score. Several factors, such as abilities of independent learning and thinking and abundant network information, are considered to facilitate the obvious distinctions between young adults and elders. Al-Khashan et al[33] performed a cross-sectional study to find out any possible gender differences in HE needs and preferences and showed that there are a few significant differences between men and women in Saudi Arabia. On the contrary, no difference in HE between male and female was confirmed in this study.

Various results-based recommendations were made to increase public health knowledge. Baerlocher et al[32] surveyed 100 consecutive patients scheduled to undergo an interventional procedure at a community hospital and found that 84% had a clearer view of what interventional radiologists do after the procedures, but 98% believed that most others did not know what interventional radiology was. Our study examined the effects of teaching of HE in 52 HCC patients scheduled to accept TACE procedure and suggested that HE is also efficient in improving health knowledge, especially the knowledge of interventional procedure.

Table 4 Comparisons of health knowledge scores (HKQ) before and after HE in patients

HKQ score	Control group, pre-TACE	HE group, pre-HE	HE group, post-HE	Pre-TACE vs post-HE		Pre-HE vs post-HE	
				t (or *t*′)	*P*-value	*t* (or *t*′)	*P*-value
n	63	52	52				
Question 1	1.81±0.592	1.75±0.653	2.00±0.000	2.555[a]	0.013	2.761	0.008
Question 2	1.30±0.463	1.29±0.457	1.65±0.480	3.994	0.000	5.419	0.000
Question 3	1.21±0.722	1.08±0.763	1.75±0.437	4.973[a]	0.000	6.617	0.000
Question 4	1.56±0.713	1.40±0.774	1.77±0.425	1.987[a]	0.050	3.686	0.001
Question 5	1.59±0.816	1.46±0.896	1.96±0.194	3.522[a]	0.001	4.233	0.000
Total	7.46±2.481	6.98±2.570	9.13±0.950	4.936[a]	0.000	7.431	0.000

Note: [a]Equal variances not assumed, *t*′ test.
Abbreviations: HE, health education; HKQ, health knowledge questionnaire; TACE, transarterial chemoembolization.

Table 5 Correlation between health knowledge scores (HKQ) and pain numerical rating scores (NRS-10) during the procedure in total sample (n=115)

HKQ score	Pain numerical rating scores (NRS-10)	
	r	*P*-value
Question 1	–0.186	0.047
Question 2	–0.103	0.274
Question 3	–0.282	0.002
Question 4	–0.119	0.206
Question 5	–0.159	0.090
Total	–0.235	0.011

Abbreviations: HKQ, health knowledge questionnaire; NRS-10, 0–10 numeric rating scale.

In the literature, the definite etiology of postembolization pain after TACE is not well understood. However, several pathophysiology theories, including tumor ischemia and necrosis, liver capsule distention, and secondary gallbladder ischemia etc, have been postulated.[34,35] Wang et al[13] reported that the pain of most patients who received drug analgesia during TACE procedure was not completely relieved, whereas the patients who received psychological intervention and medication got an obviously lower pain score than the former. Therefore, it was suggested that the psychological factors, as an inducement or secondary cause, may be concerned in the postembolization pain.[13] Some other previous studies suggested that several factors, including cancer diagnosis and interventional procedures, etc, contribute to the psychological distress of patients.[13,15,16] Owing to lack of the information of disease or interventional procedures, diagnostic and therapeutic procedures performed in the interventional radiology department are anxiety provoking and painful for some patients. Wang et al[14] surveyed 213 patients requiring interventional procedure for hepatic malignancy and confirmed that the health knowledge is associated with the psychological symptoms of the patients. In the study, the pain score in the HE group was significantly lower than that in the control group. It indicated that the HE is beneficial for the pain relief during interventional procedure. The other correlation analyses revealing that the HKQ scores of question 1, 3, and total were negatively correlated with the pain score, confirmed the importance of health knowledge, ie, information of diagnoses and interventional procedure, for pain relief again.

There are several limitations to our study. A key limitation was that the study population was a convenience sample of patients. The total study population is relatively small within a randomized controlled analysis of a prospective database. Therefore, selection and late-look bias may be inherent, and the results must be considered preliminary. Another limitation of this study was the potential bias associated with the use of self-reported measurement scales of pain intensity. Objective physiological markers, such as change in pulse rate or body temperature or neurohormonal mediators, were not studied.

Conclusion

Improving the HE among patients with HCC before TACE is beneficial for the pain relief during interventional procedure. It is recommended as a complementary approach to drug analgesia and psychological intervention.

Disclosure

The authors report no conflicts of interest in this work.

References

1. Bonekamp S, Li Z, Geschwind JF, et al. Unresectable hepatocellular carcinoma: MR imaging after intraarterial therapy. Part I. Identification and validation of volumetric functional response criteria. *Radiology*. 2013;268(2):420–430.
2. Hasselgren K, Sandström P, Björnsson B. Role of associating liver partition and portal vein ligation for staged hepatectomy in colorectal liver metastases: a review. *World J Gastroenterol*. 2015;21(15):4491–4498.

3. Torres OJ, Moraes-Junior JM, Lima e Lima NC, Moraes AM. Associating liver partition and portal vein ligation for staged hepatectomy (ALPPS): a new approach in liver resections. *Arq Bras Cir Dig*. 2012;25(4):290–292.
4. El-Serag HB. Hepatocellular carcinoma. *N Engl J Med*. 2011;365(12):1118–1127.
5. Sangro B. Chemoembolization and radioembolization. *Best Pract Res Clin Gastroenterol*. 2014;28(5):909–919.
6. Bruix J, Sherman M; Practice Guidelines Committee, American Association for the Study of Liver Diseases. Management of hepatocellular carcinoma. *Hepatology*. 2005;42(5):1208–1236.
7. Bruix J, Sherman M; American Association for the Study of Liver Diseases. Management of hepatocellular carcinoma: an update. *Hepatology*. 2011;53(3):1020–1022.
8. Marelli L, Stigliano R, Triantos C, et al. Transarterial therapy for hepatocellular carcinoma: which technique is more effective? A systematic review of cohort and randomized studies. *Cardiovasc Intervent Radiol*. 2007;30(1):6–25.
9. Zhang JP, Yan J, Xu J, et al. Increased intratumoral IL-17-producing cells correlate with poor survival in hepatocellular carcinoma patients. *J Hepatol*. 2009;50(5):980–989.
10. Zhou B, Wang J, Yan Z, Shi P, Kan Z. Liver cancer: effects, safety, and cost-effectiveness of controlled-release oxycodone for pain control after TACE. *Radiology*. 2012;262(3):1014–1021.
11. Zhou ZG, Chen JB, Qiu HB, et al. Parecoxib prevents complications in hepatocellular carcinoma patients receiving hepatic transarterial chemoembolization: a prospective score-matched cohort study. *Oncotarget*. 2016;7(19):27938–27945.
12. Yang YL, Liu L, Wang Y, et al. The prevalence of depression and anxiety among Chinese adults with cancer: a systematic review and meta-analysis. *BMC Cancer*. 2013;13:393.
13. Wang ZX, Liu SL, Sun CH, Wang Q. Psychological intervention reduces postembolization pain during hepatic arterial chemoembolization therapy: a complementary approach to drug analgesia. *World J Gastroenterol*. 2008;14(6):931–935.
14. Wang ZX, Yuan CQ, Guan J, Liu SL, Sun CH, Kim SH. Factors associated with psychological characteristics in patients with hepatic malignancy before interventional procedures. *Asian Pac J Cancer Prev*. 2012;13(1):309–314.
15. Jadoon NA, Munir W, Shahzad MA, Choudhry ZS. Assessment of depression and anxiety in adult cancer outpatients: a cross-sectional study. *BMC Cancer*. 2010;10:594.
16. Hulbert-Williams N, Neal R, Morrison V, Hood K, Wilkinson C. Anxiety, depression and quality of life after cancer diagnosis: what psychosocial variables best predict how patients adjust? *Psychooncology*. 2012;21(8):857–867.
17. Wang ZJ, Wang MQ, Duan F, et al. Transcatheter arterial chemoembolization followed by immediate radiofrequency ablation for large solitary hepatocellular carcinomas. *World J Gastroenterol*. 2013;19(26):4192–4199.
18. Llovet JM, Burroughs A, Bruix J. Hepatocellular carcinoma. *The Lancet*. 2003;362(9399):1907–1917.
19. Nogueira PA, Leal AC, Pulz C, Nogueira ID, Filho JA. Clinical reliability of the 6 minute corridor walk test performed within a week of a myocardial infarction. *Int Heart J*. 2006;47(4):533–540.
20. Muhammad A, Dhamija M, Vidyarthi G, et al. Comparative effectiveness of traditional chemoembolization with or without sorafenib for hepatocellular carcinoma. *World J Hepatol*. 2013;5(7):364–371.
21. El-Serag HB, Kanwal F. α-Fetoprotein in hepatocellular carcinoma surveillance: mend it but do not end it. *Clin Gastroenterol Hepatol*. 2013;11(4):441–443.
22. Mason MC, Massarweh NN, Salami A, Sultenfuss MA, Anaya DA. Post-embolization syndrome as an early predictor of overall survival after transarterial chemoembolization for hepatocellular carcinoma. *HPB (Oxford)*. 2015;17(12):1137–1144.
23.. European Association For The Study Of The Liver; European Organisation For Research And Treatment Of Cancer. EASL-EORTC clinical practice guidelines: management of hepatocellular carcinoma. *J Hepatol*. 2012;56(4):908–943.
24. Prajapati HJ, Xing M, Spivey JR, et al. Survival, efficacy, and safety of small versus large doxorubicin drug-eluting beads TACE chemoembolization in patients with unresectable HCC. *AJR Am J Roentgenol*. 2014;203(6):W706–W714.
25. Golfieri R, Giampalma E, Renzulli M, et al. Randomised controlled trial of doxorubicin-eluting beads vs conventional chemoembolisation for hepatocellular carcinoma. *Br J Cancer* 2014;111(2):255–264.
26. Pietrosi G, Miraglia R, Luca A, et al. Arterial chemoembolization/embolization and early complications after hepatocellular carcinoma treatment: a safe standardized protocol in selected patients with Child class A and B cirrhosis. *J Vasc Interv Radiol*. 2009;20(7):896–902.
27. Lewandowski RJ, Mulcahy MF, Kulik LM, et al. Chemoembolization for hepatocellular carcinoma: comprehensive imaging and survival analysis in a 172-patient cohort. *Radiology*. 2010;255(3):955–965.
28. Cohen MJ, Bloom AI, Barak O, et al. Trans-arterial chemo-embolization is safe and effective for very elderly patients with hepatocellular carcinoma. *World J Gastroenterol*. 2013;19(16):2521–2528.
29. Dhand S, Gupta R. Hepatic transcatheter arterial chemoembolization complicated by postembolization syndrome. *Semin Intervent Radiol*. 2011;28(2):207–211.
30. Cheng X, Sun P, Hu QG, Song ZF, Xiong J, Zheng QC. Transarterial (chemo)embolization for curative resection of hepatocellular carcinoma: a systematic review and meta-analyses. *J Cancer Res Clin Oncol*. 2014;140(7):1159–1170.
31. Siriwardana RC, Niriella MA, Dassanayake AS, et al. Factors affecting post-embolization fever and liver failure after trans-arterial chemoembolization in a cohort without background infective hepatitis- a prospective analysis. *BMC Gastroenterol*. 2015;15:96.
32. Baerlocher MO, Asch MR, Puri G, Vellahottam A, Myers A, Andrews K. Awareness of interventional radiology among patients referred to the interventional radiology department: a survey of patients in a large Canadian community hospital. *J Vasc Interv Radiol*. 2007;18(5):633–637.
33. Al-Khashan HI, Almulla NA, Galil SA, Rabbulnabi AA, Mishriky AM. Gender differences in health education needs and preferences of Saudis attending Riyadh Military Hospital in the Kingdom of Saudi Arabia. *J Family Community Med*. 2012;19(3):172–177.
34. Lv N, Kong Y, Mu L, Pan T, Xie Q, Zhao M. Effect of perioperative parecoxib sodium on postoperative pain control for transcatheter arterial chemoembolization for inoperable hepatocellular carcinoma: a prospective randomized trial. *Eur Radiol*. 2016;26(10):3492–3499.
35. Blackburn H, West S. Management of Postembolization Syndrome Following Hepatic Transarterial Chemoembolization for Primary or Metastatic Liver Cancer. *Cancer Nurs*. 2016t;39(5):E1–E18.

Journal of Pain Research Dovepress

Publish your work in this journal

The Journal of Pain Research is an international, peer reviewed, open access, online journal that welcomes laboratory and clinical findings in the fields of pain research and the prevention and management of pain. Original research, reviews, symposium reports, hypothesis formation and commentaries are all considered for publication.

The manuscript management system is completely online and includes a very quick and fair peer-review system, which is all easy to use. Visit http://www.dovepress.com/testimonials.php to read real quotes from published authors.

Submit your manuscript here: https://www.dovepress.com/journal-of-pain-research-journal