P.O.Box 2345, Beijing 100023,China
Fax: +86-10-85381893
E-mail: wjg@wjgnet.com www.wjgnet.com

World J Gastroenterol 2003;9(9):2132-2134
World Journal of Gastroenterology
 ISSN 1007-9327

• BRIEF REPORTS •

Ultrasonography guided percutaneous radiofrequency ablation for hepatic cavernous hemangioma

Yan Cui, Li-Yan Zhou, Man-Ku Dong, Ping Wang, Min Ji, Xiao-Ou Li, Chang-Wei Chen, Zi-Pei Liu, Yong-Jie Xu, Hong-Wen Zhang

Yan Cui, Li-Yan Zhou, Man-Ku Dong, Ping Wang, Min Ji, Xiao-Ou Li, Chang-Wei Chen, Zi-Pei Liu, Yong-Jie Xu, Hong-Wen Zhang, Department of Hepatobiliary Surgery, Beijing 306 Hospital, Chaoyang District, Beijing 100101, China
Correspondence to: Yan Cui, Director of Department of Hepatobiliary Surgery, Beijing 306 Hospital, 9 Anxiang Beili, Chaoyang District, Beijing 100101, China. cuiyan@public.fhnet.cn.net
Telephone: +86-10-66356138 **Fax:** +86-10-64876056
Received: 2003-05-10 **Accepted:** 2003-06-02

Abstract

AIM: Hepatic cavernous hemangioma (HCH) is the most common benign tumor of the liver and its management is still controversial. Recent success *in situ* radiofrequency ablation of hepatic malignancies has led us to consider using this technique in patients with HCH. This study was to assess the efficacy, safety, and complications of percutaneous radiofrequency ablation (PRFA) under ultrasonography guidance in patients with HCH.

METHODS: Twelve patients (four men and eight women, age ranged 33-56 years, mean age was 41.7 years) with 15 hepatic cavernous hemangiomas (2.5 cm to 9.5 cm) were treated using the RF-2000 generator and 10-needle LeVeen electrode percutaneously guided by B-ultrasound. Lesions larger than 3 cm were treated by multiple overlapping ablations that encompass the entire lesion as well as a rim of normal liver tissue (approximately 0.5 cm).

RESULTS: All the patients who received PRFA therapy had no severe pain, bleeding or bile leakage during and after the procedures. Nine to 34 months' follow-up (mean, 21 months) by ultrasound and/or spiral CT scan demonstrated that the ablated lesions in this group were shrunk remarkably, and the shrunken range was 38-79 % (mean, 67 % per 21 months). The contrast enhancement was disappeared within the tumor or at its periphery in all cases on spiral CT scans obtained 3 to 6 months after treatment.

CONCLUSION: The results of this study suggest that PRFA therapy is a mini-invasive, simple, safe, and effective method for the treatment of selected patients with HCH.

Cui Y, Zhou LY, Dong MK, Wang P, Ji M, Li XO, Chen CW, Liu ZP, Xu YJ, Zhang HW. Ultrasonography guided percutaneous radiofrequency ablation for hepatic cavernous hemangioma. *World J Gastroenterol* 2003; 9(9): 2132-2134
http://www.wjgnet.com/1007-9327/9/2132.asp

INTRODUCTION

Hepatic cavernous hemangioma (HCH) is the most common benign tumor of the liver, its incidence in necropsy series ranges from 0.4 % to 7.4 %. It occurs at all ages and affects women predominantly,the sex ratio is 1.5-6:1, and may increase in size with pregnancy or with administration of estrogens. The majority of HCHs are small, single and asymptomatic. About 20 % are large (>5 cm) and 10 % to 29 % are multiple[1-5]. The largest HCH reported in the literature was 63 cm×48.5 cm×40 cm in size and 18 kg in weight[5]. They are often discovered incidentally on routine abdominal ultrasonography or at the time of laparotomy and necropsy. The widespread use of ultrasound (US) and computerized topography (CT) scanning nowadays has made the diagnosis of HCH easier. HCHs usually become symptomatic as they reach a certain size. Abdominal pain or discomfort is the most common complaint. Rarely, large HCHs sequester and destroy platelets, causing symptomatic thrombocytopenia, known as Kasabach-Merritt syndrome. Occasionally, these vascular lesions rupture spontaneously, or with minimal trauma, and present as hemoperitoneum[1-6].

The management of HCHs is still controversial. *In situ* radiofrequency ablation (RFA) of hepatic malignant tumors[7-21] has led us to consider using this minimally invasive technique in patients with HCH. On the basis of our successful experience in controlling hepatic malignances, we applied the percutaneous RFA (PRFA) guided by B-US to the treatment of patients with HCH and the initial results were promising[22,23]. This article describes our preliminary experiences and evaluates the efficacy, safety, and complications of PRFA therapy for HCHs.

MATERIALS AND METHODS

The study was performed at the RFA center of our department with the approval from the hospital authority. Written informed consent was obtained from each patient prior to treatment.

Twelve consecutive patients with 15 cavernous hemangiomas of the liver were treated with PRFA from May 2000 to June 2002. There were four males and eight females. Age ranged from 33 to 56 years (mean, 41.7 years). Eleven patients had a single lesion (4.8 cm to 9.5 cm), and one patient had four lesions (2.5 cm to 7.0 cm). The tumors were located in the right lobe of the liver in nine patients, left lobe in five, and both lobes in one. Nine patients had discomforts in the right upper quadrant of abdomen, while the remaining three were asymptomatic. The definite histologic diagnosis of HCHs was established by means of enhanced spiral CT scan and B-US guided percutaneous biopsy with 16-gauge biopsy needles in all cases.

The patients were fasted for 4 hours and under conscious sedation and analgesia induced by administering promethazine hydrochloride 25 mg, pethidine hydrochloride 50 mg and morphine hydrochloride 10 mg intravenously. An intercostal or subcostal approach was selected according to the location of hemangiomas in the liver. Local anesthesia was achieved by using 5 ml to 8 ml of 1 % lidocaine. The 10-needle LeVeen electrode, which was connected to the RF-2000 generator (Radio Therapeutics Corp., Mountain View, CA, USA), was inserted percutaneously into and fully deployed within the target tumor under real-time B-US guidance. Grounding was achieved by attaching two dispersive pads on the thighs of patients. The power was set at 30 watts initially and increased by 10 watts per minute until 90 watts were delivered via the needle electrode. The tissue impedance was monitored

automatically by using circuitry incorporated within the generator and the treatment was stopped at roll off. The ablation overlaps were intended so as to destroy HCHs completely. For tumors larger than 3 cm in diameter, the tip of LeVeen needle electrode was readjusted repeatedly under real-time B-US guidance until the entire lesion as well as a rim of normal liver tissue (approximately 0.5 cm) were encompassed and destroyed. The vital signs of patients were monitored continuously during the procedure. The patients were allowed to have a light diet six hours after PRFA therapy. Prophylactic antibiotics and liver protectives were given intravenously for 2 to 3 days. To evaluate the response of hemangiomas to PRFA therapy, B-US and enhanced spiral CT scan were performed regularly by using the same parameters as used for the pretreatment examination. Tumor size was observed, and complete tumor necrosis was considered when no focal enhancement was seen within the tumor or at its periphery on spiral CT scans obtained 3 to 6 months after the treatment.

RESULTS

All treatments were technically successful. When the patients were treated under sedation and analgesia, they experienced a mild pain during the procedure, which disappeared immediately following cessation of PRFA. As radiofrequency energy was applied to the treatment probes, a hyperechoic focus was observed by B-US around the uninsulated portion of the electrodes, which was attributed to the tissue vaporization, microbubble formation and tissue necrotic coagulation. There was a single treatment session in one tumor which was 2.5 cm in diameter, and 2-7 treatment sessions in 14 tumors which were 4.8 cm to 9.5 cm in diameter. The duration of the treatment sessions was quite different from patient to patient, and even from lesion to lesion in the same patient. The average treatment duration was 39 minutes (8-125 minutes). The liver function study showed that serum aspartate aminotransferase (AST) and alanine aminotransferase (ALT) levels were increased two to three times above the baseline values, and normalized 2-5 days posttreatment. No change was observed in other serum element levels. No PRFA-related complications including bleeding or bile leakage occurred, and no repeated PRFA treatment was needed. The post-PRFA course was uneventful, and the patients were discharged on the third to fifth day postprocedure. The fact that the hospital stay was longer than that in Western countries was largely due to our local preferences and social reasons.

All the patients were followed up for 9 to 34 months (mean, 21 months). Nine patients' discomforts in the right upper quadrant of abdomen were ameliorated, the symptoms were significantly or completely controlled in 7 patients for a mean of 2 months (range 1-4 months). B-US and CT scan showed that the ablated lesions were swollen within 2 to 4 weeks after PRFA and started to shrink thereafter. The shrunk range was 38-79 % (mean, 67 % per 21 months). The contrast enhancement was disappeared within the tumor or at its periphery in all cases on spiral CT scans obtained 3 to 6 months after treatment.

DISCUSSION

Traditionally, surgical resection has been considered the choice of treatment for HCHs including those of symptomatic, larger than 10 cm in diameter, and manifested as Kasabach-Merritt syndrome. Steroid therapy and external radiation have provided relief for a few patients[1-5]. The transcatheter arterial embolization (TAE), an effective interventional therapy for hepatic malignancies, has also been advocated for the treatment of HCHs[24,25]. However, there are some differences of hepatic hemodynamics between hepatic malignancies and HCHs[26,27]. The value of TAE as well as its disadvantages have not been fully evaluated. Though TAE has the advantages of avoiding operative intervention and prolongation of hospitalization, TAE may result in disastrous consequences including complications of severe destructive biliary damages and ectopic embolizations[28-30].

Recent successes in local treatment of malignant tumors of the liver have led us to consider using the minimally invasive PRFA in patients with HCHs. In the procedure, the needle-electrode with an insulated shaft and an uninsulated distal tip is inserted directly into hepatic tumor through percutaneous approach under local anesthesia and conscious sedation by the guidance of ultrasonography. Energy is transferred from the uninsulated distal tip of the needle to the tissue as current rather than as direct heat. As the alternate current flows to the grounding pads, it agitates ions in the surrounding tissue of the needle tip, resulting in frictional heat exceeding 80-100 ℃. The local tissue is heated and dried, creating a 3.5 cm to 5.0 cm oval or spherical thermal coagulative necrosis. Thus the tumors are ablated and destroyed *in situ*. The dead cells are not removed, but they eventually shrink and become scar tissues[7-17].

On the basis of our successful experience in controlling hepatic malignances with PRFA therapy, we applied this technique to the treatment of HCHs with a considerable success, and our initial experience was reported in 2001[22, 23]. To our knowledge, this is the first publication on the use of percutaneous radiofrequency ablation therapy for hepatic cavernous hemangiomas. We observed that the patients who accepted PRFA recovered quickly, the ablated lesions were remarkably shrunk after treatment, and no minor or major complications occurred. PRFA has an additional advantage of being easily repeated, so large HCHs can be retreated and the benefits of it to HCHs are definite, which is quite different from the repeat PRFA for hepatic malignancies in which local tumor control is greatly influenced by its size[7-12]. In this group, we managed to adjust LeVeen needle electrode repeatedly under real-time B-US guidance, and large HCHs were completely ablated, and repeat treatment was not needed. Our study showed that this technique was safe and effective for the treatment of HCHs in selected patients. An important limitation of PRFA is related to location of HCHs, in which the near-hilum, near-gallbladder and submembranous HCHs should not be heated lest the tumor' s surrounding tissues or organs be damaged. The interference with the ribs, lung, and adjacent bowel may also affect the procedure.

It is well documented that HCHs should not be disturbed by attempts at biopsy or aspiration, lest serious bleeding occurs, so percutaneous biopsy is contraindicated[1-3]. But several studies have also shown that percutaneous fine needle biopsy with ultrasound guidance is safe for HCH diagnosis[31-35]. We performed percutaneous biopsy successfully in patients with HCHs unexpectedly in our early diagnostic liver biopsies. Along with the experience with recent practice of PRFA for hepatic malignances, we performed both B-US guided biopsy with 16-gauge biopsy needle and PRFA therapy with 15-gauge LeVeen electrode needle in patients with HCHs. There was no hemorrhage or other complications, indicating that both percutaneous biopsy and PRFA therapy under ultrasonography guidance can be performed safely for the diagnosis and treatment of HCHs.

In conclusion, the results of this study suggest that PRFA is a promising and minimally invasive technique for the treatment of HCHs. Long-term studies to assess the clinical outcome of PRFA for HCHs are ongoing. We believe that by virtue of its mini-invasion, effectiveness, simplicity, safety, and easy repeatability, PRFA therapy can be the choice of treatment for HCHs in selected patients.

REFERENCES

1 **Kew MC**. Tumors of the liver. In: Zakim D, Boyer TD, eds. Hepatology. A textbook of liver disease. *Philadelphia: W.B. Saunders Company* 1982:1048-1084
2 **Smith III RB**, Warren WD. The liver. In: Nardi GL, Zuidema GD, eds. Surgery. Essentials of clinical practice. Fourth edition. *Boston: Little, Brown and Company* 1982: 416-446
3 **Meyers WC**. Neoplasms of the liver. In: Sabiston DC, ed. Textbook of Surgery. The biological basis of modern surgical practice. Thirteenth edition. *Philadelphia: W.B.Saunders Company* 1986: 1079-1092
4 **Wu BW**, Wu MC, Zhang XH, Chen H, Yao XP, Yang JM, Yang GS. Surgical treatment for cavernous hemangiomas of the liver: 640 cases report. *Shijie Huaren Xiaohua Zazhi* 1997; **5**: 644
5 **Zhang XH**, Wu MC, Chen H. Cavernous hemangioma of the liver: clinical analysis of 21 cases. *Chin Med J* 1979; **92**: 61-66
6 **Chen ZY**, Qi QH, Dong ZL. Etiology and management of hem morrhage in spontaneous liver rupture: a report of 70 cases. *World J Gastroenterol* 2002; **8**:1063-1066
7 **Rossi S**, Di Stasi M, Buscarini E, Cavanna L, Quaretti P, Squassante E, Garbagnati F, Buscarini L. Percutaneous radiofrequency interstitial thermal ablation in the treatment of small hepatocellular carcinoma. *Cancer J Sci Am* 1995; **1**: 73-81
8 **Livraghi T**, Goldberg SN, Lazzaroni S, Meloni F, Solbiati L, Gazelle GS. Small hepatocellular carcinoma: treatment with radiofrequency ablation versus ethanol injection. *Radiology* 1999; **210**: 655-661
9 **Curley SA**, Izzo F, Delrio P, Ellis LM, Granchi J, Vallone P, Fiore F, Pignata S, Daniele B, Cremona F. Radiofrequency ablation of unresectable primary and metastatic hepatic malignancies: Results in 123 patients. *Ann Surg* 1999; **230**: 1-8
10 **Solbiati L**, Livraghi T, Goldberg SN, Ierace T, Meloni F, Dellanoce M, Cova L, Halpern EF, Gazelle GS. Percutaneous radio-frequency ablation of hepatic metastases from colorectal cancer: long-term results in 117 patients. *Radiology* 2001; **221**: 159-166
11 **Kuvshinoff BW**, Ota DM. Radiofrequency ablation of liver tumors: influence of technique and tumor size. *Surgery* 2002; **132**: 605-612
12 **Shiina S**, Teratani T, Obi S, Hamamura K, Koike Y, Omata M. Nonsurgical treatment of hepatocellular carcinoma: from percutaneous ethanol injection therapy and percutaneous microwave coagulation therapy to radiofrequency ablation. *Oncology* 2002; **62**(Suppl 1): 64-68
13 **Guo W**, Zhang ZS, Yuan AL. Treatment of liver malignant tumor by percutaneous radiofrequency thermal abation. *Shijie Huaren Xiaohua Zazhi* 2000; **8**: 208-210
14 **Wang CP**, Wang Y, Peng XJ, Hu DR. Radiofrequency ablation in treatment of liver neoplasms. *Shijie Huaren Xiaohua Zazhi* 2000; **8**: 323-324
15 **Zhu T**, Cao J, Chu HM. B-ultrasound guided multiple probe ablation of metastasis of liver: results in 40 patients. *Shijie Huaren Xiaohua Zazhi* 2001; **9**: 971-972
16 **Liu LX**, Jiang HC, Piao DX. Radiofrequence ablation of liver cancers. *World J Gastroenterol* 2002; **8**: 393-399
17 **Jiang HC**, Liu LX, Piao DX, Xu J, Zheng M, Zhu AL, Qi SY, Zhang WH, Wu LF. Clinical short-term results of radiofrequency ablation in liver cancers. *World J Gastroenterol* 2002; **8**: 624-630
18 **Rai R**. Radiofrequency ablation: A good regional therapy for liver cancer. *World J Gastroenterol* 2003; **9**: 192
19 **Liu LX**, Zhang WH, Jiang HC. Current treatment for liver metastases from colorectal cancer. *World J Gastroenterol* 2003; **9**: 193-200
20 **Tang ZY**. Progress in the treatment of hepatocellular carcinoma. *Shijie Huaren Xiaohua Zazhi* 2003; **11**: 249-254
21 **Zhou ZG**. Advance in minimally invasive surgery in 21st century. *Shijie Huaren Xiaohua Zazhi* 2002; **10**: 869-872
22 **Cui Y**, Zhou LY, Hou YJ, Lin J, Xu YJ, Wang P, Dong MK, Ji M, Liu ZP, Li XO, Xiao GS, Chen CW. Percutaneous radiofrequency ablation for hepatic cavernous hemangiomas. *Zhonghua Gandan Waike Zazhi* 2001; **7**: 665-666
23 **Xu YJ**, Liang HZ, Cui Y, Zhou LY, Hou YJ, Lin J. Real-time ultrasound guided radiofrequency ablation for hepatic cavernous hemangiomas. *Zhongguo Yixue Yingxiang Jishu* 2002; **18**: 1334
24 **Deutsch GS**, Yeh KA, Bates WB 3rd, Tannehill WB. Embolization for management of hepatic hemangiomas. *Am Surg* 2001; **67**: 159-164
25 **Srivastava DN**, Gandhi D, Seith A, Pande GK, Sahni P. Transcatheter arterial embolization in the treatment of symptomatic cavernous hemangiomas of the liver: a prospective study. *Abdom Imaging* 2001; **26**: 510-514
26 **Xie ZG**, Wang ZD. Blood supply of hepatic cavernous haemangioma and interventional treatment. *Xin Xiaohua Bingxue Zazhi* 1996; **4**: 46-48
27 **Ouyang Y**, Ouyang XH, Yu M, Gu SB. Frequency of arteriovenous shunts in hepatic cavernous hemangiomas in adults as seen on selective arteriography and postembolization radiography. *Cardiovasc Intervent Radiol* 2001; **24**: 161-167
28 **Wang X**, Zhong YX, Zhang LL, Huang YX, Wen QS, Chu YK, Zhang HX, Wang QL. Effect of IL-8 and ET-1 on secondary liver injury by hepatic arterial embolization in rabbits. *Shijie Huaren Xiaohua Zazhi* 2000; **8**: 413-416
29 **Huang ZQ**, Huang XQ. Changing patterns of traumatic bile duct injuries: a review of forty years experience. *World J Gastroenterol* 2002; **8**: 5-12
30 **Huang XQ**, Huang ZQ, Duan WD, Zhou NX, Feng YQ. Severe biliary complications after hepatic artery embolization. *World J Gastroenterol* 2002; **8**:119-123
31 **Solbiati L**, Livraghi T, De Pra L, Ierace T, Masciadri N, Ravetto C. Fine-needle biopsy of hepatic hemangioma with sonographic guidance. *Am J Roentgenol* 1985; **144**: 471-474
32 **Brambs HJ**, Spamer C, Volk B, Wimmer B, Koch H. Histological diagnosis of liver hemangiomas using ultrasound-guided fine needle biopsy. *Hepatogastroenterology* 1985; **32**: 284-287
33 **Caturelli E**, Rapaccini GL, Sabelli C, De Simone F, Fabiano A, Romagna-Manoja E, Anti M, Fedeli G. Ultrasound-guided fine-needle aspiration biopsy in the diagnosis of hepatic hemangioma. *Liver* 1986; **6**: 326-330
34 **Chen KW**, Zhu CB, Chen YM. Diagnosis of hepatic cavernous hemangiomas through repeated biopsies: case report. *Xin Xiaohua Bingxue Zazhi* 1997; **5**: 768
35 **Caturelli E**, Pompili M, Bartolucci F, Siena DA, Sperandeo M, Andriulli A, Bisceglia M. Hemangioma-like lesions in chronic liver disease: diagnostic evaluation in patients. *Radiology* 2001; **220**: 337-342

Edited by Zhang JZ and Wang XL