

Comparison of short- and long-term therapeutic effects of laparoscopic and open-type hepatectomy for primary hepatic carcinoma.

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Abstract

Objective: To compare short- and long-term therapeutic effects of laparoscopic and open-type hepatectomy for primary hepatic carcinoma.

Method: Forty patients with primary hepatic carcinoma in our hospital were recruited from January 2013 to August 2014. They were divided into two groups, namely, laparoscopic and open-type, with 20 cases in each group, and their short- and long-term therapeutic effects were then compared.

Results: Intra-operative bleeding quantity, length of operative incision, extubation time, eating time, and length of stay in the laparoscopic group were lesser than those in the open-type group; operation time was more than that in the open-type group ($P < 0.05$). Comparative differences in pre-operative liver functions, such as Aspartate Transaminase (AST) and Alanine Transaminase (ALT), between the two groups did not have statistical significance ($P > 0.05$). Three days after the operation, AST and ALT levels of both groups increased to peak values ($P < 0.05$). However, 10 days after operation, the decrease in AST and ALT levels was obviously faster in the laparoscopic group than in the open-type group ($P < 0.05$); the occurrence rate of post-operative complications was obviously lesser in the laparoscopic group than in the open-type group ($P < 0.05$); comparative differences in three-year recurrence and survival rates between the two groups did not have statistical significance ($P > 0.05$).

Conclusion: Laparoscopic hepatectomy provided several advantages, such as small trauma, minor influence on liver function, and few post-operative complications, for patients with primary hepatic carcinoma; however, its post-operative three-year survival rate was equivalent to that of open-type operation, indicating its high therapeutic value.

Keywords: Laparoscope, Open-type hepatectomy, Primary hepatic carcinoma, Short-term and long-term therapeutic effect.

Accepted on October 17, 2017

Introduction

Primary hepatic carcinoma is a clinically common malignant tumor. Relevant data have shown that the number of patients newly diagnosed with primary hepatic carcinoma each year in China has exceeded 350,000 [1]. In terms of death rates of all types of tumors, primary hepatic carcinoma has the second highest case fatality rate, and it has brought enormous burden to patients' families and the society. The pathogenesis of this disease is related to primary diseases, such as viral hepatitis, liver cirrhosis, and aflatoxin, as well as other carcinogenic substances [2]. For these patients, operation, Chinese herbs, and radiotherapy are common interventions, with operation being the main therapeutic method. Traditional open-type operation causes significant trauma, post-operative complications, and slow post-operative recovery for patients. However, our hospital has recently introduced laparoscopic hepatectomy. In the present work, the comparative results between laparoscopic and open-type hepatectomy are reported.

Data and Methodology

General data

Forty patients with primary hepatic carcinoma in our hospital from January 2013 to August 2014 were recruited. The inclusion criteria were as follows: 1) patients with single lesions by CT examination; 2) patients with no injection within one week before the operation; 3) patients with no intrahepatic metastasis or abdominal dropsy; and 4) patients who were willing to sign the informed consent form. The patients were divided into two groups, namely, laparoscopic and open-type, according to therapeutic methods with 20 cases in each group. In the laparoscopic group, 13 were male and 7 were female; their age ranged from 45 to 72 y old, with the average age being (56.15 ± 2.61) y old. Tumor diameters ranged from 3 cm to 7 cm (average value: (4.26 ± 0.51) cm). According to Child-Pugh score, the liver function of 16 and 2 cases belonged to grades A and B, respectively. Patients with other tumors, serious cardiopulmonary and renal dysfunction, or metabolic

diseases, such as diabetes, were excluded in the study. Comparative differences between the two groups in terms of baseline data did not have statistical significance ($P>0.05$) and were comparable.

Methodology

For the open-type group, conventional open-type hepatectomy was implemented according to concrete position, size, and quantity of lesions of each patient. For the laparoscopic group, general anesthesia was given, CO₂ pneumoperitoneum was established, and intra-abdominal pressure was set at 13-14 mm Hg. Five-hole operation method was used. Pre-operative images and probing result of tumor location were confirmed through pre-tangent lines in the operation. The distance from the pre-tangent line to the lesion was guaranteed to exceed 1 cm. Electrocoagulation was conducted simultaneously with separation of liver tissues. Tumor excision was completed from outside to inside and from shallow to deep. The tumor was washed repeatedly, and bleeding or bile leakage symptoms were checked. If symptoms were present, occlusion, transfixion, and electrocoagulation were performed. Finally, excised tissues were placed in a specimen bag, and a catheter was placed on the wound surface for drainage. Conventional fluid infusion, anti-inflammation, anti-infection, and liver protection treatments were conducted in both groups after the operation.

Observational indexes

Basic treatment conditions: Basic treatment conditions, such as average operation time, intra-operative bleeding quantity, length of operative incision, extubation time, eating time, and length of stay, between the two groups were recorded.

Detection of liver functions: A total of 3 ml fasting elbow venous blood was collected in the morning before, three days after, and 10 d after the operation, and fully automatic biochemical analyzer was used to detect changes in liver functional levels, such as Aspartate Transaminase (AST) and Alanine Transaminase (ALT).

Occurrence rate of complications

Occurrence rates of complications, such as bile leakage, bleeding, pleural effusion, pulmonary infection, subphrenic abscess, and incision infection, between the two groups were calculated.

Long-term therapeutic effect

Post-operative follow-up visits were performed for three years, and recurrence and long-term survival rates between the two groups were calculated.

Statistical analysis

The data obtained in this study were analysed using SPSS 19.0 statistical software; t-test and χ^2 test were used for enumeration

and measurement data, respectively; and statistical significance was considered at $P<0.05$.

Results

Comparison of basic treatment conditions between the two groups

Intra-operative bleeding quantity, length of operative incision, extubation time, eating time, and length of stay were obviously lesser in the laparoscopic group than in the open-type group; operation time was more in the laparoscopic group than in the open-type group ($P<0.05$). Details are shown in Table 1.

Comparison of liver functions between the two groups

Comparative differences in pre-operative liver functional levels, such as AST and ALT, between the two groups did not have statistical significance ($P>0.05$). Three days after the operation, AST and ALT levels in both groups increased to peak values ($P>0.05$); however, 10 days after the operation, the decrease in AST and ALT levels was faster in the laparoscopic group than in the open-type group ($P<0.05$). Details are shown in Table 2.

Comparison of occurrence rate of complications between the two groups

In the laparoscopic group, two patients experienced bile leakage, and one experienced bleeding. The occurrence rate of complications was 15.00% (3/20). In the open-type group, three patients experienced bile leakage, two experienced bleeding, and pleural effusion, pulmonary infection, subphrenic abscess, and incision infection were separately experienced by one patient. Moreover, the occurrence rate of complications was 45.00% (9/20). Occurrence rate of complications in the laparoscopic group was obviously lower than that in the open-type group ($\chi^2=4.2857$, $P=0.0384$).

Comparison of long-term therapeutic effect between the two groups

Comparative differences in three-year recurrence and survival rates between the two groups did not have statistical significance ($P>0.05$). Details are shown in Table 3.

Table 1. Comparison of basic conditions between the two groups ($\bar{x} \pm S$, $n=20$).

Index	Laparoscopic group	Open-type group	P-value
Operation time (min)	187.30 \pm 25.38	109.80 \pm 27.60	0.0003
Intra-operative bleeding quantity (ml)	137.20 \pm 26.00	170.00 \pm 28.64	0.0005
Length of operative incision (cm)	5.18 \pm 0.71	26.87 \pm 1.70	0.0000
Extubation time (d)	3.10 \pm 0.64	3.98 \pm 1.28	0.0335
Eating time (d)	1.15 \pm 0.40	1.69 \pm 0.60	0.0018

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Length of stay (d)	8.40 ± 2.10	10.04 ± 2.35	0.0414
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Table 2. Comparison of liver functions between the two groups ($\bar{x} \pm S$, n=20).

Group	AST (U/L)			ALT (U/L)		
	Before	3 d	10 d	Before	3 d	10 d
Laparoscopic	75.59 ± 18.48	179.37 ± 16.29	80.74 ± 14.80	55.58 ± 21.18	164.54 ± 17.35	65.18 ± 10.40
Open-type	76.00 ± 18.84	183.60 ± 11.97	134.28 ± 14.90	55.60 ± 21.20	168.24 ± 18.00	93.48 ± 12.64
P-value	0.9450	0.2393	0.0000	0.9976	0.3431	0.0000

Table 3. Comparison of long-term therapeutic effects between the two groups.

Group	n	First year		Second year		Third year	
		Recurrence	Survival	Recurrence	Survival	Recurrence	Survival
Laparoscopic	20	1 (5.00)	19 (95.00)	6 (30.00)	16 (80.00)	10 (50.00)	15 (75.00)
Open-type	20	2 (10.00)	18 (90.00)	7 (35.00)	17 (85.00)	11 (55.00)	14 (70.00)
χ ² value		0.3604	0.3604	0.1140	0.1732	0.1003	0.1254
P-value		0.5483	0.5483	0.7357	0.6773	0.7515	0.7233

Discussion

Chronic liver disease is caused by many factors and will probably play an important role in the genesis and development of hepatic carcinoma. Epidemiologic and experimental studies show that viral hepatitis has specific relationship with the genesis of primary hepatic carcinoma [3,4]. Viral hepatitis is mainly divided into hepatitis B-D. Hepatitis B has the closest relationship with hepatic carcinoma, and the increased number of patients with hepatic carcinoma with negative HBsAg is related to Hepatitis C. In the former Soviet Union, cases of hepatitis D were widespread. In China, approximately 90% of patients with hepatic carcinoma have hepatitis B virus. Other dangerous factors include alcoholic cirrhosis, hepatic adenoma, long-term intake of aflatoxin, other types of chronic active hepatitis, Wilson’s disease, tyrosinemia, and glycogenosis. Early clinical symptoms of primary hepatic carcinoma are atypical. Patients have already developed to an advanced stage when they are diagnosed, which seriously threatens their health. Conventional partial hepatectomy is one of the main means of treating this disease [5,6]. However, it needs further improvement due to its disadvantages, such as significant trauma, large intra-operative bleeding quantity, high occurrence rate of post-operative complications, and slow recovery. Laparoscopic operation can significantly improve the short-term recovery effect as it results in small operative incision, less trauma, small post-operative scar, and sufficient embodiment of minimally invasive feature [7,8].

Operation implemented under a laparoscope allows complete inspection and confirmation without touching surrounding organs. Laparoscopic operation can excellently expose the field of view and even observe nerves and blood vessels. Therefore, it not only significantly improves operative accuracy but also offers convenience for elaborate operation and timely control

of intra-operative bleeding. Most especially, it has greatly lowered the operative difficulty for separation and transfixion of large blood vessels, increasing operative safety and success rates [9]. In addition, pneumoperitoneal pressure can reduce the bleeding quantity of small veins in laparoscopic operations. Moreover, laparoscopic instruments have ideal hemostatic effects and avoiding bleeding phenomenon on liver resection [10]. This study showed that intra-operative bleeding quantity, length of operative incision, extubation time, eating time, and length of stay were obviously lesser in the laparoscopic group than in the open-type group (P<0.05).. The occurrence rate of post-operative complications was obviously lesser in the laparoscopic group than in the open-type group (P<0.05). Comparative differences in three-year recurrence and survival rates between the two groups did not have statistical significance (P>0.05). In this study, liver functions in the two groups were obviously damaged compared with those before operation; however, the damage was lesser and post-operative recovery was faster in the laparoscopic group than in the open-type group. In addition, laparoscopic operative process was implemented in a small space; thus, the body of patients bore minor interference and the trauma was far smaller than open-type operation, which could effectively reduce occurrence of post-operative complications and contribute to early wound healing. Moreover, it can facilitate patients to have early and painless respiration and off-bed movement and accelerate the recovery of gastrointestinal motility.

Conclusion

Laparoscopic hepatectomy has several advantages, such as less trauma, minor influence on liver functions, and few post-operative complications. Its post-operative three-year survival rate is equivalent to open-type operation. The procedure

provides satisfactory long-term therapeutic effect; thus, it is worthy of clinical promotion and application.

References

1. Chen W, Zheng R, Baade PD, Zhang S, Zeng H, Bray F, Jemal A, Yu XQ, He J. Cancer statistics in China, 2015. *CA Cancer J Clin* 2016; 66: 115-132.
2. Tsai JF, Chen SC, Lin ZY, Dai CY, Huang JF, Yu ML, Chuang WL. Independent and additive interaction between polymorphisms of tumor necrosis factor α -308 and lymphotoxin α +252 on risk of hepatocellular carcinoma related to hepatitis B. *Kaohsiung J Med Sci* 2017; 33: 453-457.
3. Fujiwara N, Friedman SL, Goossens N, Hoshida Y. Risk factors and prevention of hepatocellular carcinoma in the era of precision medicine. *J Hepatol* 2017.
4. Kamiyama T, Orimo T, Wakayama K, Shimada S, Nagatsu A, Yokoo H, Kamachi H, Yamashita K, Shimamura T, Taketomi A. Survival outcomes of hepatectomy for stage B Hepatocellular carcinoma in the BCLC classification. *World J Surg Oncol* 2017; 15: 156.
5. Omar HA, Zaher DM, Srinivasulu V, Hersi F, Tarazi H, Al-Tel TH. Design, synthesis and biological evaluation of new pyrrolidine carboxamide analogues as potential chemotherapeutic agents for hepatocellular carcinoma. *Eur J Med Chem* 2017; 139: 804-814.
6. Park J, Kim S, Song I and Chun K. Experience of laparoscopic liver resection for various liver diseases. *Korean J Hepatobiliary Pancreat Surg* 2014; 18: 112-117.
7. Yarmohammadi H, Wilkins LR, Erinjeri JP, Novak RD, Exner AA, Wu H, Petre EN, Boas E, Ziv E, Haaga JR. Efficiency of combined blocking of aerobic and glycolytic metabolism pathways in treatment of N1-S1 hepatocellular carcinoma in a rat model. *J Cancer Res Ther* 2017; 13: 533-537.
8. Han HS, Shehta A, Ahn S, Yoon YS, Cho JY, Choi Y. Laparoscopic versus open liver resection for hepatocellular carcinoma: Case-matched study with propensity score matching. *J Hepatol* 2015; 63: 643-650.
9. Ahn KS, Kang KJ, Kim YH, Kim TS, Lim TJ. A propensity score-matched case-control comparative study of laparoscopic and open liver resection for hepatocellular carcinoma. *J Laparoendosc Adv Surg Tech A* 2014; 24: 872-877.
10. Zhu Q, Luo M, Zhou C, Zhou Z, He Z, Yu X, Zhou S. A proteomics-based investigation on the anticancer activity of alisertib, an Aurora kinase A inhibitor, in hepatocellular carcinoma Hep3B cells. *Am J Transl Res* 2017; 9: 3558-3572.

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