Peritoneal Lavage With Distilled Water During Liver Resection in Patients With Spontaneously Ruptured Hepatocellular Carcinomas

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Spontaneously rupture of hepatocellular carcinoma is a life threatening and worse prognosis. Not only the lower rate of resection and hemodynamic unstable, but also the hepatic failure and recurrence. Distilled water irrigation had been applied in several cancer surgeries including colon, stomach, breast, ovary, and bladder; thus had good results in lowering the tumor spreading. We applied distilled water peritoneal lavage after liver resection in patients with spontaneous rupture of hepatocellular carcinoma to define the influence of prognosis. Thirteen patients with spontaneous ruptured hepatocellular carcinoma underwent distilled water peritoneal lavage after curative liver resection (Group A). Nineteen patients with spontaneous ruptured hepatocellular carcinoma did not undergo distilled water peritoneal lavage after curative liver resection (Group B). There were 11 patients of tumor recurrence in Group B; 2 in Group A. The mean disease-free time of Group B was 2.05 ± 0.74 years; for Group A it was 3.59 ± 0.60 (P = 0.045). Peritoneal lavage in this series resulted in significantly better survival time for the patients in Group A (P = 0.0158). That implies distilled water peritoneal lavage during liver resection would retard the tumor recurrence and further improve the survival rate in patients with spontaneously ruptured hepatocellular carcinoma.


KEY WORDS: peritoneal lavage; distilled water; spontaneous rupture; hepatocellular carcinoma; liver resection

INTRODUCTION

Spontaneous rupture of a hepatocellular carcinoma (HCC) is a life-threatening condition. It is uncommon in Western countries and is seen in fewer than 3% of patients who develop this tumor [1,2]. In Asia, the incidence ranges from 10% to 26% [3]. The outcome depends on the presence of underlying liver cirrhosis, the extent of the tumor, the time of diagnosis, the degree of hemorrhage, and the type of therapy [4]. Apart from the danger of liver failure, recurrence of the tumor is another concern as it can cause death after hepatectomy [3,5].

Several methods have been used to treat a ruptured HCC, including transcatheter hepatic artery embolization (TAE), microwave therapy, cryotherapy, intralesional alcohol injection, packing or plication, and resection [6]. However, curative liver resection is the only procedure that appears to promise long-term survival [6]. However, surviving patients face a high tumor recurrence rate [7] and evokes risk of implanted metastases [8]. Since its first description by Price in

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1905 [9], intraoperative peritoneal lavage has been widely performed for the removal of bacteria and tumor cells from the abdominal cavity. It has now been applied to several forms of abdominal cancer surgery including those on the colon, stomach, and bladder [10–12]. Recently, Emmanuel et al. reported peritoneal lavage in patients with colon cancer and found 100% cell lysis achieved after 14 minutes of distilled water incubation in vivo [11]. Four lavage cycles removed most of the tumor cells [13].

Here we present our premier result of distilled water peritoneal lavage (DWPL) technique during liver resection in patients with a spontaneously ruptured HCC.

**DWPL Technique**

Application of the 10 L of distilled water was divided into at least five cycles. In each cycle, the peritoneal cavity was filled with warm (35–40°C) distilled water and retained for 3 min, then the water was drawn out from the abdominal cavity. The process was repeated until the 10 L of distilled water was used up. The whole procedure took about 15–20 min.

**Results**

Thirteen patients with spontaneous ruptured HCC underwent DWPL after curative liver resection (Group A). Nineteen patients with spontaneous ruptured HCC did not undergo DWPL after curative liver resection (Group B). Two patients of non-curative liver resection and 4 patients of surgical mortality were excluded. The preoperative clinical characteristics and surgical types were not significantly different between the two groups. There were 11 patients of tumor recurrence in Group B; 2 in Group A The mean disease-free time of Group B was 2.05 ± 0.74 years; for Group A it was 3.59 ± 0.60 (P = 0.045). Peritoneal lavage in this series resulted in significantly better survival time for the patients in Group A (P = 0.0158).

**Conclusion**

Abdominal lavage had been applied to several forms of abdominal cancer surgery [10–12]. Brundell et al. reported significantly greater numbers of cell were removed by lavage by the first to third lavage cycle, after the fourth lavage cycle, relatively few cells were removed by each further cycle [13]. Over half of the tumor cells could be removed. Emmanuel et al. reported peritoneal lavage in patients with colon cancer and found 100% cell lysis achieved after 14 min of distilled water incubation in vivo [11]. We applied not only five cycles lavage at least to attempt to “clear” the intra-abdominal tumor cells but also hypotonic fluid (distilled water) retained for longer time to attempt to “kill” them as possible. As to temperature of distilled water, we set it around 35–40°C, but the effect of temperature on lysing tumor cells has not been studied.

Distilled water is readily available, and the procedure is quick and easily applied clinically. It took us about 15–20 min. We think that it is worthwhile to spend a little more time to perform this procedure, as it promises a longer disease-free interval and a longer survival time. We presented our premier results of DWPL technique in spontaneous ruptured HCC, and we need more time to follow up the further result. In conclusion, DWPL during liver resection implied retarded tumor recurrence and improved the survival rate in patients with a spontaneously ruptured HCC. This approach could be also applied to iatrogenic HCC rupture.

**References**
