



How to minimize conversion to open surgery during laparoscopic liver resection: the point of view of hemostasis

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It has been 30 years since laparoscopic liver resection was first introduced, and, in the beginning, wedge resection or nonanatomical liver resection was mainly performed. With the development of surgical techniques and instruments, many centers are currently performing major liver resections and even difficult anatomical liver resections such as segment VI, VII, and VIII and caudate segment. However, laparoscopic surgery has limitations in instrument manipulation, and due to the nature of liver resection surgery, massive bleeding may occur. Therefore, it is necessary to make efforts to minimize the bleeding and reduce the conversion to laparotomy due to bleeding.

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Laparoscopic liver resection (LLR) has been widely performed recently. The difficulty of LLR is determined by the anatomical location of the liver to be resected, and, recently, many LLRs have been performed in difficult locations due to the increase in surgical experience [1,2].

As in this study [3], one of the most important reasons for conversion to open surgery is bleeding during surgery, and the causes of bleeding are various, such as the size, location, and number of tumors, and the degree of cirrhosis of the liver. Minimizing bleeding and, if there is bleeding, quick hemostasis can help to reduce unplanned conversion to open surgery [4–6]. In patients who are expected to have a high probability of conversion to open surgery, it is possible to minimize bleeding and reduce blood transfusion or operation time by making the decision

to conversion to open surgery quickly [7].

It is necessary to accurately understand the intrahepatic location of the tumor and the vascular structures around it through images such as computed tomography before surgery; based on this, the surgical resection margin can be predicted. Exact placement of the trocar so that it can be resected comfortably along the predicted surgical margin allows the operator to operate in a comfortable position, which can help prevent bleeding [8].

In case of bleeding, inflow control by intracorporeally or extracorporeally Pringle maneuver is an established method to decrease bleeding during LLR and is widely used [9]. Outflow controls by Trendelenburg positioning, lower central venous pressure (<5 mmHg), slightly increasing intra-abdominal CO₂ pressure (10–14 mmHg), or hanging maneuver are a helpful method to

minimize bleeding and can be easily applied [7,10].

In addition, surgeons should be experienced with the use of all surgical devices for LLR and should be skillful in laparoscopic suture before starting LLR [10]. The technical limitations of LLR are continuously being overcome, and better instruments are expected to be developed in the future to help in the operation. More prospective data are required to confirm feasibility and safety of LLR.

NOTES

Conflict of interest

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