

MINI-REVIEW

# Diagnosis and Treatment of Hepatic Hemangioma

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**Abstract:** The clinical manifestations of hepatic hemangioma are not specific. At present, the diagnosis of hepatic hemangioma mainly depends on imaging examination, and the treatments are based on surgery. However, the current indications and timing for surgical treatments and surgical options for hepatic hemangioma remain controversial. This article introduces our current understanding of hepatic hemangioma and the current status of diagnosis and treatment of hepatic hemangioma, providing a basis for the standardization of diagnosis and treatment of hepatic hemangioma. Treatments of hepatic hemangioma include surgery, hepatic artery embolization, radiofrequency ablation, radiation therapy, intraoperative microwave coagulation, cryotherapy, and sclerotherapy. Surgical treatment is the preferred option for patients without surgical contraindications.

**Keywords:** Hepatic hemangioma, Surgery, Diagnosis, Treatment

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## 1 Introduction

Hepatic hemangioma is the most common benign tumor of the liver, and most of the pathological types are cavernous hemangioma<sup>[1,2]</sup>. In recent years, with the popularization of physical examinations and the advancement of various imaging diagnostic techniques, the discovery rate of asymptomatic diseases has increased significantly. Since some hepatic hemangioma may rupture and the damage may involve important structures of the liver, surgical intervention is needed. At present, the basic and clinical studies related to hepatic hemangioma are scarce, and the diagnosis and treatment are not standardized. The diagnosis of hepatic hemangioma mainly depends on various imaging examinations, whereas the treatments of hepatic hemangioma include surgery, hepatic artery embolization, and radiofrequency ablation<sup>[3,4]</sup>.

Despite deep understanding of the pathophysiology and natural course of hepatic hemangioma, there are still many debates about the indications and timing of treatment, as well as the treatment methods. A consensus in this regard which is confirmed by large-scale and multi-center clinical research is urgently required.

## 2 Diagnosis and differential diagnosis

The clinical manifestations of hepatic hemangioma are not specific, and the diagnosis relies mainly on imaging examinations, such as ultrasound, computed tomography (CT), and magnetic resonance imaging (MRI). Ultrasound examination which is the first choice for screening hepatic hemangioma in the clinical setting is less expensive, safe, reliable, and reproducible. In an ultrasound examination, hepatic hemangioma is typically characterized by a clear echogenic space with a clear echo enhancement effect. Hepatic hemangioma shows uniform and clear low-density lesions when the CT scan is performed. As a result, after enhancement, nodular enhancement around the low-density area is shown. On the

other hand, MRI has a special diagnostic significance for this disease. The T<sub>1</sub>-weighted image shows a uniform low signal with clear edges, while the T<sub>2</sub>-weighted image shows a distinctly high signal, which is a typical light bulb sign<sup>[5-7]</sup>.

Through imaging examination, a most hepatic hemangioma can be accurately diagnosed, and a small number of cases need to be carefully differentiated from cases such as liver cancer, focal nodular hyperplasia, and hepatic adenoma. To improve the accuracy of the diagnosis, it is necessary to understand whether the patients have a medical history of hepatitis and cirrhosis and perform the laboratory investigation to detect tumor markers such as alpha-fetoprotein and CA19-9. For cases that are still unable to be clearly diagnosed, surgical exploration should be carried out to determine the condition and also to simultaneously treat the disease through surgery<sup>[8,9]</sup>.

### 3 Indications and timing for surgical treatment

According to the published reports, the indications for hepatic hemangioma are mainly based on the occupation, gender, age, and clinical symptoms of the patients, as well as the size, location, and nature of the tumor.

Common clinical symptoms of hepatic hemangioma are upper abdominal discomfort, dull pain, abdominal distension, and loss of appetite, which are caused by the tumor pulling the liver capsule or pressing the adjacent tissues and organs of the gastrointestinal tract. The diagnosis of hepatic hemangioma often imposes mental burden on patients. Therefore, patients with clear symptoms or strong psychological requirements for treatment should be actively treated<sup>[10]</sup>.

The key factors in the treatment of hepatic hemangioma are tumor size and location. Most scholars tend to refer hepatic hemangioma with diameter >10 cm to as large hepatic hemangioma, and those with diameter >15 cm to as giant hepatic hemangioma. Patients with tumors <5 cm are considered as having small hepatic hemangiomas which are asymptomatic and associated with few complications, such as rupture and hemorrhage, should be under surveillance. Large hepatic hemangioma which is located especially at the edge of the liver or in the hilar is prone to rupture or compression of the hilar bile duct and blood vessels and is often accompanied by coagulopathy caused by Kasabach-Merritt syndrome. Thus, the patients with large hemangioma must be treated early. The diameter of the tumor at about 5–10 cm is regarded as a relative treatment indication, and the diameter of the tumor at >10 cm coupled with an apparent increase in size indicates a necessity for treatment such as surgery regardless of the manifestation of symptoms<sup>[11-13]</sup>.

Surgical treatment should be carried out on the patients who have small hemangioma that cannot be distinguished from malignant tumors and have a medical history of

chronic hepatitis or positive detection result of tumor markers. In addition, individuals who engage in strenuous exercises, such as boxers and football players, may consider early surgery to prevent the traumatic rupture of hepatic hemangioma. Since estrogen and progesterone can stimulate the growth of hepatic hemangioma, the young women who are diagnosed giant hemangioma should be informed of the hemangioma removal<sup>[14]</sup>. For elderly patients who are more than 60 years old, especially those who have with serious diseases of other organs, they should be put under regular observation<sup>[14,15]</sup>.

## 4 Treatments of hepatic hemangioma

### 4.1 Surgical treatments

At present, the clinical path for managing hepatic hemangioma does not incorporate a well-defined treatment plan because the clinical classification and treatment specifications of hepatic hemangioma are not yet integrated<sup>[16,17]</sup>. Nonetheless, treatments of hepatic hemangioma include surgery, hepatic artery embolization, radiofrequency ablation, radiation therapy, intraoperative microwave coagulation, cryotherapy, and sclerotherapy. Surgical treatment that can completely remove the lesion is the preferred option for patients without surgical contraindications. In comparison to surgical treatment, other methods can only reduce the tumor, and predispose the patients to complications such as bleeding, bile leakage, and infection.

The surgical treatments of hepatic hemangioma mainly include hepatic hemangioma extracapsular dissection, anatomical hepatectomy, laparoscopic and robotic hepatic hemangioma surgery, and hepatic hemangioma suture. Extracapsular dissection separates the thin fibrous envelope between the hemangioma and the surrounding liver tissue. The hemangioma is exfoliated along with the interface, which can reduce bleeding, completely remove the lesion and maximize the preservation of normal liver tissue<sup>[18]</sup>. The removal of hemangioma without involving resection of liver tissue has become the ideal basis of surgical treatment for hepatic hemangioma.

For giant hepatic hemangioma involving important structures in the liver, extracapsular dissection or irregular hepatic lobe resection can lead to difficulty in hemostasis during the surgery, secondary bleeding, bile leakage, and other complications, and thus, regular anatomical hepatectomy can be used. Anatomical hepatectomy is divided into surgical methods that depend on the location and size of the hemangioma and these methods include hepatic segmentectomy, hepatectomy, hepatic resection, and multiple hepatectomy. Anatomical hepatectomy is an effective treatment for giant hemangiomas, but this method involves the removal of some normal liver tissue, which is traumatic and may trigger many complications.

In addition, not only the general condition of the patient but also the volume and quality of the residual liver should

be considered before operation. The indocyanine green excretion test can accurately reflect the hepatic functional reserve. It is also possible to perform three-dimensional imaging of liver vessels to understand the relationship between hemangioma and large blood vessels in the liver, as an approach to improve the safety of surgery. During the surgery, it is recommended to perform autologous blood transfusion, which can greatly reduce the amount required for allogeneic blood transfusion<sup>[19,20]</sup>.

In the past 10 years, with the improvement of techniques and instruments, laparoscopic, and robotic hepatic hemangioma surgery has achieved rapid development. For appropriate case selection, laparoscopic and robotic hepatic hemangioma surgery is safe and feasible, and associated with less trauma, faster recovery, and fewer complications. Laparoscopic and robotic liver surgery requires a high level of experience in both open hepatectomy and proficient laparoscopic and robotic surgery. Since hemorrhage is prone to occur in surgery if the hepatic hemangioma is located in caudate lobe and middle lobe, it would be difficult and risky to apply laparoscopic and robotic surgery. Hepatic hemangioma should not be removed along with the hemangioma envelope in laparoscopic and robotic surgery. Therefore, similar to open surgery, regular hepatectomy is an effective, reliable, and safe choice. Although the cost of laparoscopic and robotic surgery and related equipment is significantly higher than that of open surgery, the post-operative hospitalization time and cost are shorter and lower than that of open surgery<sup>[21,22]</sup>. In fact, there is no significant difference in the total cost of hospitalization between the two types of surgeries.

On the other hand, hepatic hemangioma suture is a safe, effective, and simple treatment for patients with multiple small scattered on the surface of the liver. This method is used to block or shrink the hemangiomas. However, the application of hepatic hemangioma suture has gradually decreased in recent years because the recurrence of hemangioma happens even after suturing.

## 4.2 Non-surgical treatments

Since the non-surgical treatments manifest limited efficacy in the treatment of hepatic hemangioma and are also accompanied by the same complications, it is not feasible to recommend non-surgical options for the treatment of hepatic hemangioma. The more common non-surgical treatments of hepatic hemangioma are the hepatic artery embolization and radiofrequency ablation.

With the continuous development of interventional radiology, hepatic artery embolization has become an effective method for the treatment of hepatic hemangioma. Hepatic hemangioma is mainly supplied by the hepatic artery. In practice, when the embolic agent reaches abnormal blood vessels, endothelial cells will be destroyed and the blood starts disintegrating and accumulating, leading to thrombosis, secondary atrophy, and fibrosis.

Thus, hepatic artery embolization can occlude the blood flow to hemangioma through the hepatic artery, as hemangioma are mainly supplied by the hepatic artery. However, hepatic artery embolization can only temporarily control the condition, since it is not a radical measure. Furthermore, hepatic artery embolization can cause serious complications, such as intrahepatic biliary necrosis, hepatic abscess, biliary cirrhosis, and hepatic atrophy, and its clinical application has certain limitations<sup>[23,24]</sup>.

Radiofrequency ablation is a method of ultrasound-guided, laparoscopic, and open laparotomy using the thermal effects of high-frequency currents to cause coagulative necrosis of hemangioma. Radiofrequency ablation is suitable for small hemangiomas located on the surface of the liver, away from the hilar and diaphragm. It is minimally invasive and simple<sup>[25]</sup>. However, the effect of radiofrequency ablation on large hemangiomas is not pronounced, and it is easy to relapse. Thus, this non-surgical alternative is mainly used in patients with small hepatic hemangioma.

## 5 Outlook

With the development of surgical techniques and equipment, hepatic hemangioma treatment has made great progress. However, treatment for hepatic hemangioma remains controversial, because the opinions on the indications and methods of treatment are contradictory. At present, there has been a sign of over-treatment of hepatic hemangioma using surgical treatment. In fact, only <20% of those patients actually need surgical treatment. In addition, studies have shown that there was no difference in the quality of life in patients with hepatic hemangioma <5 cm between the surgery and follow-up periods<sup>[3,16]</sup>.

Nonetheless, surgical treatment of hepatic hemangioma, despite the fact that it is a benign liver disease, should be considered in many aspects to maximize the benefits of patients. Taken together, it is imperative to carry out large-scale prospective clinical study to standardize and to improve the clinical diagnosis and treatment of hepatic hemangioma.

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## Conflicts of interest

The authors declare that they have no conflicts of interest.

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