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Long term follow up after resection emphasizes the role of surgery in Primary Hepatic Epithelioid Hemangioendothelioma

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HIGHLIGHTS

- Primary Hepatic Epithelioid Hemangioendothelioma is an extremely rare tumor of vascular origin. In this work we present clinical data and long term results of eight patients who were surgically treated in our institution.
- Liver transplantation was performed in five patients (four cadaveric and one living related) and major liver resection in three patients. After a median follow up of 100 months (48–266) all eight patients are alive. During follow up, three patients developed recurrent tumor, one in the lung and the liver, one only in the liver, and one patient developed systemic metastases.

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ABSTRACT

Background: Primary Hepatic Epithelioid Hemangioendothelioma is an extremely rare tumor of vascular origin.
Patients: In this work we present clinical data and long term results of eight patients who were surgically treated in our institution. Liver transplantation was performed in five patients (four cadaveric and one living related) and major liver resection in three patients. Three patients are alive with recurrent tumor. After a median follow-up of 100 months (48–266) all patients are alive.
Conclusions: Only surgery can provide cure in HEH. If the extent of the disease prohibits primary resection liver transplantation might offer the most valuable option.

1. Background

Primary Hepatic Epithelioid Hemangioendothelioma (HEH) is an extremely rare tumor of vascular origin with an incidence of <0.1 per 100,000 population [1]. The first larger series of HEH was reported by Ishak et al. in a series of 32 patients [2]. There, its grade of malignancy was described ranging from benign hemangioma to dedifferentiated hemangiosarcoma although to date most data clearly point out that all HEH should be classified as low grade malignancy (in contrast to hepatic angiosarcoma which are persistently high grade malignancies) [3]. Apart from the liver, it has been described to arise in various other locations such as soft tissue, bones or lungs [4,5]. Despite improvements in diagnostics (i.e. MRI, CEUS) final diagnosis and extent of disease can only be determined by the pathologist [6]. Diagnostic immunhistochemical markers for HEH are typical vascular markers such as F VIII-antigen, CD31 CD34 and ERG [5]. Still showing great difficulties in morphological diagnosis and differentiation from (high grade) angiosarcoma new helpful molecular markers were described in the last few years including YAP-TFE3 and WWTR1-CAMTA1 fusion transcripts and variants in at least a subset of HEH [7,8]. Male-to-female ratio reported in literature is 2:3, the mean age 42 years [9]. Clinical manifestation is highly heterogeneous. Often the first clinical sign is pain in the upper right quadrant, but symptoms like ascites, weight loss, weakness, anorexia, nausea and jaundice have been described. In a quarter of reported patients the tumor was asymptomatic [9]. The rarity of HEH has limited any randomized controlled treatment trials resulting in a variety of treatment

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strategies. Currently, liver resections as well as liver transplantation are potential treatment options. No studies are available favoring one of these strategies.

1.1. Report of patients

Between 1992 and 2011, eight patients underwent liver resection for primary HEH in our institution. Four of these eight patients have been reported previously with a shorter follow up [10]. Liver transplantation has been performed in five of the eight patients; of whom three patients had a salvage liver resection before transplantation. Patient and disease characteristics are summarized in Table 1. All eight treated patients were female. Age at the time of resection ranged between 31 and 61 years. Median postoperative follow up time was 100 months (range 48–266).

1.2. Diagnosis

Since most patients present with symptoms like abdominal pain, weakness or weight loss [9] at their general practitioner, in most cases ultrasound or contrast enhanced ultrasound (CEUS) is an economic and safe diagnostic tool [6,11]. All patients were seen in the multidisciplinary liver outpatients' clinic. Pre-operative assessment comprised clinical evaluation and computed tomography or magnetic resonance imaging of the chest, abdomen, pelvis and brain and bone scan if needed. Gastroduodenoscopy and colonoscopy were performed to exclude other origin of the hepatic lesions. In six patients disease was limited to the liver; in two patients systemic disease with pulmonary metastases was diagnosed.

1.3. Multimodal treatment

We did not perform radiation therapy in any of our patients. The patient who had received chemotherapy prior to surgery had received this chemotherapy to bridge the time until transplantation. No chemotherapy was given in an adjuvant or neoadjuvant intention.

1.4. Surgical treatment

In the three patients where complete tumor resection was achievable, tumor resection was performed. In two patients transection of the liver parenchyma was performed as stapler hepatectomy [12,13]. In patient #7 tumor lesions were present in liver segments 4–8. Segments 2 and 3 as future liver remnant seemed too small for immediate extended right hemihepatectomy, so we decided to perform interventional embolisation of the right portal vein to induce growth of segments 2 and 3 [14,15]. Hereby the liver volume of segments 2 and 3 increased by 15% in 4 weeks, and extended right hepatectomy could successfully be performed.

In the five patients with non-resectable tumor disease in both left and right liver transplantation was performed. Transplantation of cadaveric liver was performed in modified piggyback technique. In living donor transplantation the left liver was transplanted.

1.5. Resection despite systemic disease

In two patients, we resected the liver tumor despite systemic tumor spread as part of an individualized treatment strategy. The first patient (#5, Table 1) was 32 years old, had multiple small masses in both lung with a maximum size of 5 mm. One of those nodules was resected and the diagnosis of hemangioendothelioma was proven. Multiple masses in the right liver were present, the biggest 28 mm in segment VII. In our tumor board we agreed to explore the liver and performed a right hemihepatectomy and atypical resection of masses in segments II, III and IVb. Confirmed by intra-operative ultrasound, we could achieve a complete tumor resection. Nine months after liver resection, a newly growing mass in liver segment III was treated by radio frequency induced thermo ablation. Within the further course, atypical resection of the pulmonary metastases (five in the right and 22 in the left lung) was performed in two operations three and six months after liver resection. Today, 48 months after liver resection and 42 months after the last lung resection, the patient has no evidence of tumor growth in the lung or liver.

The second patient (#8, Table 1) was 45 years old at the time of liver resection. Diagnosis of HEH with pulmonary metastasis was made seven years prior to surgery. Sequential treatment with PTK 787, interferon, thalidomide, Silamarin and doxorubicin succeeded in maintaining stable disease. In the presence of massive refractory ascites and worsening of liver function we decided to list her for transplantation as an individual treatment approach. She received an organ from a patient suffering from amyloidosis (domino-procedure). Today, the tumor manifests in liver, lungs, spleen and

Table 1
Patients' characteristics.

Patient	Age	Tumor manifestation	Surgery	Postoperative complications	Follow-up period (mo)	Clinical outcome
1	35	Multiple lesions in all liver segments	Liver transplantation (cadaveric, with aorto-hepatic conduit)	Bile duct necrosis treated by hepaticojejunostomy	266	Alive without recurrence
2	61	Right liver	Right hemihepatectomy with partial diaphragm resection	Abdominal wall fistula without surgical intervention	196	Alive without recurrence
3	32	Multiple lesions in all liver segments	Liver transplantation (living related)	Bile duct necrosis treated by bile duct revision	112	Alive without recurrence
4	33	Multiple lesions in all liver segments	TACE[a] followed by combined cadaveric liver and kidney transplantation	Secondary wound healing	131	Alive without recurrence
5	32	S II, III, IVb, V, VII, pulmonary metastasis	Right hemihepatectomy, atypical resection S II, III, IVb	None	48	Alive with recurrence in the liver
6	31	Multiple lesions in all liver segments	Liver transplantation (cadaveric)	None	61	Alive with systemic disease and recurrence in the liver
7	56	Multiple lesions in segments IV–VIII	PVE[b] followed by trisegmentectomy S IV–VIII	None	84	Alive without recurrence
8	45	Multiple lesions in all segments, pulmonary metastasis	Liver transplantation (living donor, Domino)	Leakage of biliary anastomosis, stent implantation; incarcerated incisional hernia, resection of jejunum	87	Alive with systemic disease, no recurrence in the liver

[a] TACE: Trans arterial chemo embolisation.
[b] PVE: Portal vein embolisation.

bones, but the patient is living in a good quality, 87 months after transplantation.

2. Discussion

Our clinical experience confirms that surgical treatment and liver transplantation for HEH is a favorable therapeutic concept resulting in significant long term survival. Even though the female-to-male ratio is reported to be 3:2 [5], all of our eight patients are female. The age at diagnosis in our patients ranged between 29 and 61 years (6 patients between 29 and 38 years, one patient 55 and one patient 61 years).

In a comprehensive review of 306 patients we reported previously [6] that only in 13% of all cases the tumor presents in a single manifestation, and more often in the right liver. In the patients reported in this series, only one patient had unifocal tumor.

The most common treatment approach for HEH in almost half of all reported cases is liver transplantation [6]; this was the treatment in five of the eight patients in our series. There is no data giving preference to resection or transplantation. The shortage of organs available for transplantation makes the choice of resection inevitable in cases where complete resection is feasible. In our series, two of eight patients (25%) suffered from extra hepatic metastasis upon time of resection, the percentage reported in literature ranging from 16.9% to 36.6% [9,16–19]; in some series only resected patients, in other only transplanted patients, and in others patients treated with various approaches are reported. Presence of extra hepatic disease, however, is not always a contraindication for resection, as shown by the course of the two patients reported here and in other series [16–19]. An individual treatment strategy has to be created for each individual patient after interdisciplinary discussion of the patient and the biological characteristics of the tumor.

An effect of various chemotherapeutic substances on HEH has been reported. Systemic treatment options applied did include anti-angiogenesis drugs such as thalidomide [20–22], immunotherapy with interferon α-2B [23], kinase inhibitors [24,25] or conventional chemotherapy [26]. Varying results of these studies limit the interpretability of the reported series [9]. Overall the therapeutic aim of these systemic treatments is consistent with the treatment intention to delay liver transplantation.

There is no evidence for an additional positive effect of multimodal therapy on survival or freedom from recurrence. Since HEH in most cases is a slowly growing tumor and metastasis is rare [9,16–19] resection offers the only chance of cure and should be performed whenever feasible. While systemic spread is present and complete tumor resection cannot be provided, chemotherapy might prolong survival [9]. Despite individual reports of the benefit of radiation therapy [27], it is generally not considered as an option in the treatment of HEH.

Due to the rarity of the disease and the heterogeneity of inclusion criteria and therapies applied, survival rates reported in literature vary considerably, ranging from 88 to 100% one year and 43–83% five years after therapy [5,18,19,28–30]. In our patients, median survival is 100 months today (48–266), with all eight patients being alive.

3. Conclusion

Only surgery can provide cure in HEH. It is difficult to diagnose HEH at an early time point of the disease since symptoms are unspecific and most doctors will never encounter a patient with HEH in their lives. Upon diagnosis even major liver surgery is not possible anymore in most patients due to the tendency of the tumor to spread within the liver and affect both left and right liver. In the majority of cases liver transplantation offers the only chance of cure.

Ethical approval

n.a.

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Author contribution

Arianeb Mehrabi: data collection, discussion.
Katrin Hoffmann: data collection, proof reading.
Karl Heinz Weiss: data collection, proof reading.
Carolin Mogler: pathology, proof reading.
Peter Schemmer: data collection, proof reading.
Markus W. Büchler: proof reading.
Ingo Alldinger: data collection, manuscript.

Conflicts of interest

There are no conflicts of interest to be disclosed.

Guarantor

Ingo Alldinger.

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