Ruptured hepatoblastoma treated with primary surgical resection

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The aim of this study was to review two cases of ruptured hepatoblastoma treated with primary surgical resection. Hepatoblastoma is the most common primary liver malignancy of childhood, although it remains infrequent. A rare, but serious condition is when the tumor presents with spontaneous rupture. This is a well-known phenomenon; however, it is rarely reported in the literature, and the long-term outcomes of various management strategies are currently unclear. We present two cases of patients in whom primary surgical resection was performed and discuss outcomes, and also present a current literature review. Children with ruptured hepatoblastoma treated with emergency primary surgical resection, followed by adjuvant chemotherapy, may have favorable outcomes. *Ann Pediatr Surg* 10:54–56 © 2014 Annals of Pediatric Surgery.

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Introduction

Hepatoblastoma is the most common primary liver malignancy of childhood, and accounts for ~80% of liver tumors in children [1]. The incidence of hepatoblastoma has almost doubled since the 1970s, although it remains rare, with an estimated 1.5 cases per million children [2]. With recent advances in chemotherapy protocols and surgical resection techniques, survival rates approach 100% for stage 1 tumors [1]. It is universally agreed upon that the most important prognostic factor is to achieve complete resection without residual disease [3]. Those tumors that are deemed inoperable after neoadjuvant chemotherapy because of large tumor size, including involvement of all four sectors of the liver; location, including near or involving the portal veins, or all three hepatic veins; or tumors that are multifocal should be treated by liver transplantation [1,4].

A rare but serious situation is when the tumor presents with spontaneous rupture or hemorrhage, which has historically had a poor prognosis [5]. Although presentation of ruptured hepatoblastoma is a well-known phenomenon, it is rarely reported in the literature. To date, 10 cases of ruptured hepatoblastoma have been reported in the literature that discuss treatment and outcomes, each utilizing various treatment strategies [1,5–8]. There are several other articles that report cases of ruptured hepatoblastoma as part of larger cohorts of patients; however, these cases are not discussed in detail and there is no mention of treatment strategies or outcomes. Currently, there is no consensus on which management strategy is superior or offers the most favorable long-term outcome, and the question remains as to whether a ruptured tumor should be considered primarily resectable. We present two cases of ruptured hepatoblastoma that were managed with primary hepatectomy, followed by adjuvant chemotherapy, and discuss therapeutic options.

Case reports

Case 1

A 10-year-old female presented to the emergency department complaining of abdominal pain and multiple episodes of syncope, with a hematocrit of 23. A computed tomographic (CT) scan indicated a large amount of blood in the abdomen, as well as a large tumor arising from the left lobe of the liver. She was taken emergently to the operating room, where a large amount of blood and clot were observed in the abdomen, along with active bleeding from a necrotic tumor in segment II of the liver. The tumor was fungating in appearance and had satellite lesions just proximal to it, extending a centimeter into segment III (PRETEXT stage 1 by CT) [9]. A frozen section was sent intraoperatively, which returned showing a malignant tumor that favored the diagnosis of hepatoblastoma. There was no gross evidence of metastatic disease or peritoneal studding. A left lateral segmentectomy, removing segment II and part of segment III, was performed using an Endo-GIA (Covidien, Mansfield, Massachusetts, USA) stapler, resecting beyond the satellite lesions. Negative histological margins were achieved, and histology was mixed fetal and embryonal types. The remaining part of the left lobe of the liver, including segment IV, as well as the rest of the liver appeared normal. The patient's postlaparotomy alpha-fetoprotein level was greater than 75 000. Following resection, the patient was treated with adjuvant chemotherapy, and was free of disease, by imaging, for over 1 year, before she developed recurrence in the remaining portion of the liver (PRETEXT stage 4 lesion) [9]. There was no evidence of extra-hepatic disease at the time of recurrence. The patient then underwent additional chemotherapy, followed by orthotopic liver transplant secondary to the unresectability of the recurrent liver lesion. Approximately 1 year after her liver transplant, she developed distant metastatic disease, including abdominal,

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lung, and brain metastasis, and was treated with comfort measures only secondary to the extensive metastases. The patient subsequently died 3 years after her initial presentation.

Case 2

A 3-year-old female, with a new liver mass, considered likely to be PRETEXT stage 1 hepatoblastoma because of the markedly elevated alpha-fetoprotein levels and appearance on CT scan, presented to the emergency department with acute onset of severe abdominal pain 3 days before elective liver resection that was to be followed by adjuvant chemotherapy. There was no traumatic inciting event, and a repeat CT scan of the abdomen showed free intraperitoneal fluid consistent with blood and evidence of a ruptured tumor in the right lobe of the liver. The patient was then taken to the operating room, where a bleeding tumor was noted on the right side of the liter. Intraoperative frozen section confirmed hepatoblastoma. A segment V/VI resection was performed with over 1 cm negative margins and without evidence of lymphovascular invasion. The final pathology returned a tumor with mixed fetal and embryonal histology. She was treated with adjuvant chemotherapy on the basis of the standard COG regimens and remains disease free greater than 4 years after resection.

Discussion

Rupture is a rare, but serious presentation of hepatoblastoma, and has historically been considered to be associated with a poor prognosis [5,8]. This is based primarily on the high mortality rates reported in adult populations with ruptured hepatocellular carcinoma, with subsequent diffuse peritoneal disease and metastases [10]. In children, PRETEXT staging plays a central role in deciding therapy [9]. However, our cases indicate that ruptured hepatoblastoma in children may not have the same poor outcomes on the basis of our experience and the literature. Although the presentation of ruptured hepatoblastoma is mentioned in most basic surgical textbooks, the discussion of the presentation, treatment, and outcomes is minimal. It is unclear as to how many patients will develop diffuse peritoneal implants [7] or abdominal relapse following rupture in children and whether therapies such as total abdominal radiation should be considered for these cases [1].

Of the 10 cases of ruptured hepatoblastoma that have been reported in the literature, multiple methods of treatments utilizing surgical intervention are described, with the main difference being the timing of surgical resection (Table 1) [5,11–13]. Of the reported cases, no one management strategy was noted to be superior; some urgent intervention is obviously necessary. Primary hepatectomy, followed by chemotherapy in stable patients appears to be a reasonable choice in favorable cases with resectable disease, with the additional advantage of rapid control of bleeding and histologic diagnosis. In our cases, we were also able to achieve complete resection. In cases where complete microscopic resection may not be achieved, the child may still have favorable chances for survival as evidenced by the results in the SIOPEL-1 trial, where 11 patients with positive microscopic margins had no local recurrence following neoadjuvant chemotherapy [4]. The preoperative CT scan is crucial in determining the resectability of the lesion by PRETEXT staging and may help in deciding on the therapy.

Table 1 All reported cases of ruptured hepatoblastoma and outcomes in the literature

Management	Number of cases	Outcomes
Emergent resection with adjuvant chemotherapy [5,8]	2	Disease free for 2+ years
Emergent resection without adjuvant chemotherapy [11]	1	Death from recurrent disease 4 months after resection
Intraoperative transarterial embolization, followed by resection→adjuvant chemotherapy [10,12]	2	Disease free at 36 months, death at 30 months from complications of Rye's syndrome
Preoperative transumbilical artery embolization→hepatic lobectomy→adjuvant chemotherapy [6,10]	2	Disease free at 13 months and 2 years
Laparotomy/hepatic artery ligation→neoadjuvant chemo→staged resection [5,7]	2	Disease free at 2 and 6 years, respectively
No immediate surgical intervention [5]	1	Died during initial admission

The question that remains is as follows: should children who present with ruptured hepatoblastoma with favorable staging undergo primary surgical resection, followed by chemotherapy, or should a temporizing procedure be performed to allow for treatment with neoadjuvant chemotherapy before definitive surgical resection? Transarterial embolization (TAE) is a good temporizing alternative as it is minimally invasive and can control the bleeding to allow for a complete workup and neoadjuvant chemotherapy for nonresectable lesions. The downsides to percutaneous TAE are that it is technically difficult in children secondary to the size of the vessels, and it may also lead to complications delineating anatomy and blood supply in future hepatic resection, as well as interfere with the delivery of directed chemotherapy to the tumor site [10]. In addition, this procedure may not be available in all centers as not every center has the expertise required to perform this procedure.

Our two cases presented here add to the growing body of evidence that pediatric patients who present with ruptured hepatoblastoma can have successful outcomes with emergent hepatectomy, followed by adjuvant chemotherapy. Unquestionably, the best outcomes are achieved with early diagnosis and surgical intervention, followed by adjuvant chemotherapy, as patients in whom an urgent procedure and chemotherapy were not performed and administered had a poor prognosis. Initial stabilization with TAE may be successful if readily available and the patient is stable; however, this is often technically difficult in young children and the risk of rebleeding is unknown. This report is limited because of the fact that we only present two cases that are both PRETEXT 1 cases favorable for resection. No definitive conclusions are possible; however, our cases add to the scarce literature on this subject.

Further study should focus on determining the frequency of peritoneal seeding following tumor rupture, the effects

on tumor recurrence, and whether other modalities of treatment, including the use of total abdominal radiation therapy, would aid in survival. In addition, patient characteristics affecting morbidity and mortality following ruptured hepatoblastoma should be examined. Because of the paucity of cases of ruptured hepatoblastoma reported in the literature, each report of treatment and outcomes is beneficial to the practicing surgeon who may encounter this rare presentation in practice.

Acknowledgements

Conflicts of interest

There are no conflicts of interest.

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