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Case Report

Post-traumatic intrahepatic pseudoaneurysm: A case of successful conservative treatment^{☆,☆☆}

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ARTICLE INFO

Article history:

Received 29 September 2022

Revised 23 November 2022

Accepted 29 November 2022

Keywords:

Hepatic trauma

Hepatic artery pseudoaneurysm

Hemobilia

ABSTRACT

Although post-traumatic intrahepatic pseudoaneurysms are rare in adults and even more uncommon in children, this serious complication can result in life-threatening bleeding. Most case studies have recommended surgical or endovascular interventions for preventing rupture or managing the bleeding from a ruptured intrahepatic pseudoaneurysm. Some studies also reported pseudoaneurysms could resolve without intervention and advised conservative therapy. In this case study, we describe a 19-month-old boy diagnosed with an intrahepatic pseudoaneurysm, upper gastrointestinal bleeding from the biliary tract, and hematoma infection. The patient received successful conservative treatment. After 36 days, the patient was discharged without signs of gastrointestinal bleeding and the steady shrinkage of the hematoma surrounding the pseudoaneurysm. The pseudoaneurysm and hematoma vanished at follow-up 18 months after the trauma. Conservative treatment may be considered a viable option, particularly for cases of post-traumatic intrahepatic pseudoaneurysms in children.

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Introduction

Post-traumatic intrahepatic pseudoaneurysms (IHPAs) are rare in adults and even more uncommon in children [1], occurring at a frequency ranging from 1.2% to 1.7% following liver injury [2,3]. Because the number of cases is so small, no con-

sensus treatment guidelines have been established for IHPA [1,4]. Endovascular intervention to induce hepatic artery embolization is recommended by some studies to treat ruptured pseudoaneurysms or prevent rupture [1,5–9]. Other studies have reported that pseudoaneurysms can resolve without intervention and recommend conservative treatment with follow-up after diagnosis [4,10]. We present a rare case of IHPA

[☆] Funding: No funding was received.

^{☆☆} Competing Interests: The authors do not report any conflicts of interest.

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<https://doi.org/10.1016/j.radcr.2022.11.078>

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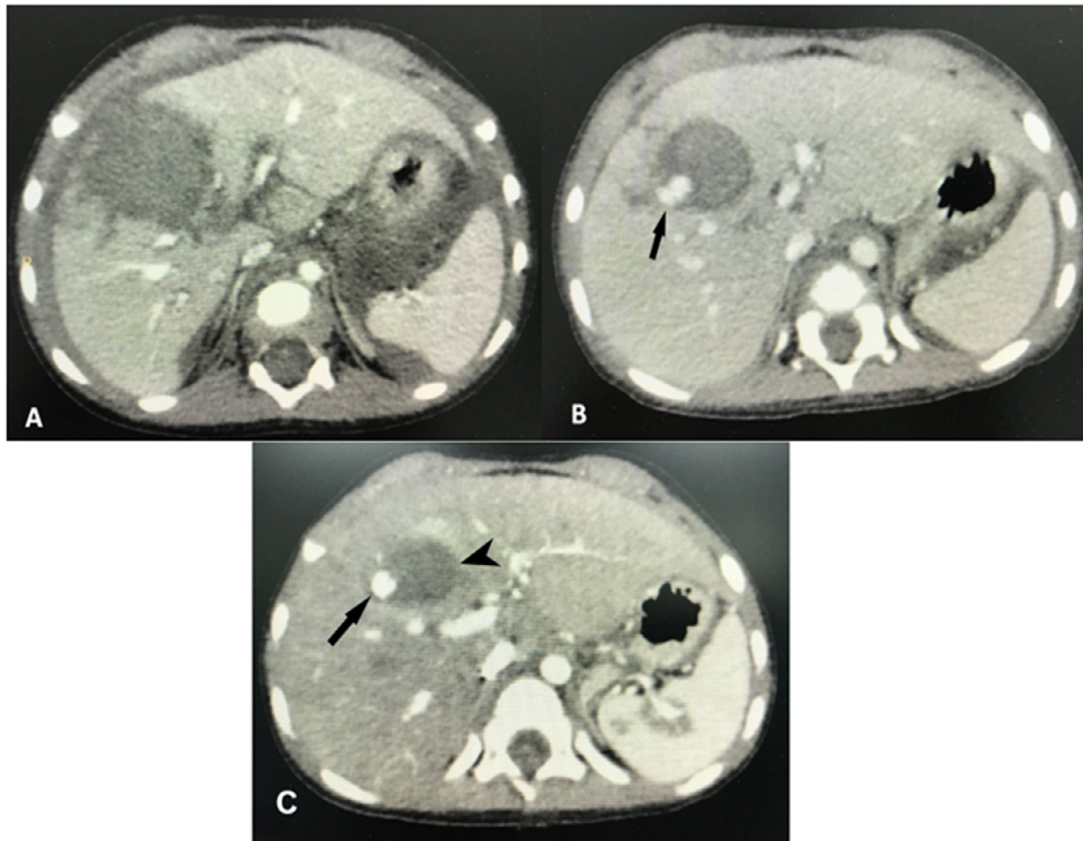


Fig. 1 – Image of liver injury on contrast-enhanced abdominal computed tomography imaging on the day of the injury and 15 and 36 days after the injury. (A) Liver parenchymal hematoma on computed tomography (CT) imaging at the time of admission (Day 1). (B) Liver parenchymal hematoma with internal pseudoaneurysm (arrow) on CT imaging 15 days after the injury. (C) The parenchymal hematoma was reduced in size (arrowhead) with a pseudoaneurysm mass (arrow) 36 days after the injury.

in a child that was successfully managed using conservative treatment.

Case report

A motorcycle fell on the chest and abdomen of a 19-month-old boy, causing abdominal pain that required admission to a local hospital. After receiving fluids and analgesics, the patient was transferred to Children's Hospital 2.

At Children's Hospital 2, the patient was diagnosed with internal bleeding-related shock, with a rapid pulse of 180 beats/min, a narrow pulse pressure of 80/65 mmHg, hematocrit at 19%, and hemoglobin at 5.5 g/dL. The patient was intravenously administered 0.9% NaCl and received 250 mL erythrocytes (25 ml/kg). Hepatic segments IVa and VIII were ruptured, and an intrahepatic hematoma measuring $46 \times 50 \times 45$ mm³ and a subcapsular hematoma with a 10-mm thickness were observed on abdominal contrast-enhanced computed tomography (CT) imaging. No extravasation or localized bleeding was observed. A small amount of right pleural effusion and abdominal blood effusion were detected (Fig. 1A). Following resuscitation, hemoglobin levels reached 12.5 g/dL, blood pressure was 94/60 mmHg, and pulse was 120 beats/min.

The treatment for liver damage was conservative due to concerns regarding hemodynamic stability, consisting of third-generation cephalosporin antibiotics and pain relief. The patient did not experience any other symptoms indicating internal hemorrhage.

The patient had melena 12 days after the accident, but hemoglobin levels were 11.6 g/dL, and no blood transfusion was required. He had an elevated white blood cell count (WBC) of 35 K/ μ L and C-reactive protein (CRP) levels of 43.8 mg/L, in addition to a fever of 39°C. Imipenem antibiotics were administered at a dose of 100 mg/kg/day. The liver hematoma was smaller on the second round of CT imaging (Day 15), measuring $43 \times 36 \times 42$ mm³, and the subcapsular hematoma, peritoneal fluid, and pleural fluid were also reduced. An IPHA measuring $8 \times 10 \times 13$ mm³ was present within the hematoma (Fig. 1B). An upper gastrointestinal endoscopy was performed to exclude other potential causes of gastrointestinal bleeding, such as peptic ulcer disease. The child was finally diagnosed with an infected parenchymal hematoma, biliary hemorrhage, and IHPA of $8 \times 10 \times 13$ mm³ following trauma.

The patient had yellow stools and no fever following 3 days of medical treatment for infection and gastrointestinal hemorrhage. We then considered whether surgical or endovascular intervention was necessary to treat hematoma infection or biliary tract bleeding. Because the clinical symptoms were

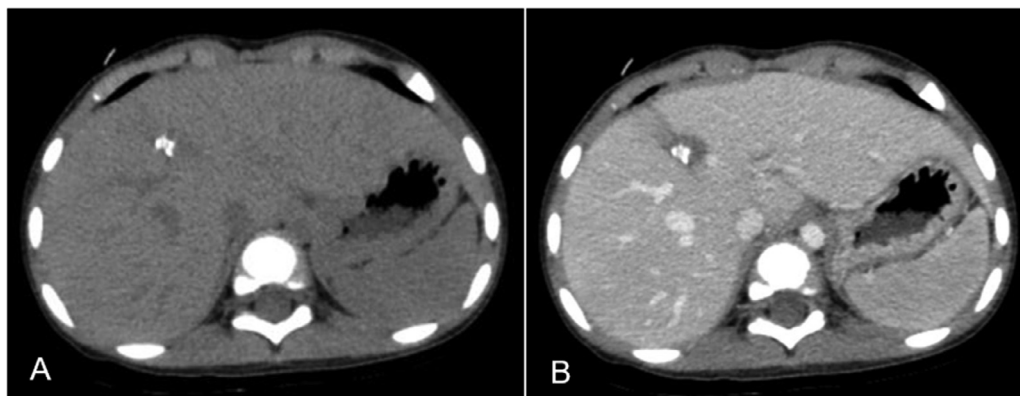


Fig. 2 – Computed tomography imaging 18 months after injury. Computed tomography imaging with (A) and without (B) contrast performed 18 months after injury revealed that the hematoma and aneurysm had disappeared, and the liver parenchyma was scarred, with nodular calcifications.

mild and the patient was stable with yellow stools and no fever, we opted for conservative treatment.

The patient was eating and drinking normally by 36 days after the injury, with no blood loss or abdominal discomfort. Tests revealed that WBC decreased to 9.7 K/ μ L; CRP, bilirubin, aspartate aminotransferase, alanine aminotransferase, and gamma-glutamyl transferase were all within the normal range. CT imaging on day 36 revealed that the GCC was the same size, but the hematoma was further reduced to 28 × 29 × 22 mm³ (Fig. 1C). The patient was discharged from the hospital.

At the 18-month follow-up, the patient had no clinical symptoms, including abdominal pain, fever, or hematuria. CT imaging performed at the 18-month follow-up revealed that the aneurysm and hematoma had disappeared, and the liver parenchyma appeared scarred and calcified (Figs. 2A and B).

Discussion

A pseudoaneurysm is a pulsatile hematoma that occurs due to the extravasation of blood from a tear or injury to a blood vessel wall. In the case of IHPA, the pseudoaneurysm walls are formed by the liver parenchyma and the surrounding hematoma [11]. Biliary bleeding in liver injury occurs due to the simultaneous destruction of hepatic blood vessels and the biliary tract, causing the formation of a hemato-biloma. The presence of the hemato-biloma in the liver parenchyma can slow the recovery process and increase the risks of infection and necrosis, which can cause further damage to adjacent structures, resulting in biliary tract bleeding [5]. In cases of liver injury, hemobilia may occur early or late (up to 120 days after trauma) [5]. In our case, the child presented with gastrointestinal bleeding starting 12 days after injury.

Hepatic artery pseudoaneurysm can be detected accidentally by imaging studies after liver injury or be diagnosed in response to clinical manifestations, such as biliary bleeding or internal bleeding, which suggest a ruptured pseudoaneurysm [10]. Digital subtraction angiography is the most accurate test for diagnosing pseudoaneurysms [10]. However, in

clinical practice, ultrasound and CT imaging are more commonly used for diagnosis and monitoring because they are less invasive [4,10]. In our case, CT imaging was used to diagnose and monitor the disease.

Post-traumatic intrahepatic pseudoaneurysm is associated with a 44% risk of rupture leading to bleeding, and the mortality rate can be as high as 82% [10]. Therefore, prophylactic interventions are commonly recommended for IHPA [1]. Although the majority of these patients were recommended for surgical interventions in the past, the current preferred intervention method is embolization [4,10,12]. Three cases of pseudoaneurysm following liver trauma described by Sidhu, including one case involving gastrointestinal bleeding responded favorably to embolization [1]. According to the recent study reported by Yi, a 10-year-old child with a pseudoaneurysm following liver trauma underwent successful preventive embolization, [8]. In addition, several publications have discussed the effectiveness of conservative treatment for IHPA. Soudack reported a case of IHPA in a 4-year-old girl who was treated conservatively, with resolution after 2.5 months of follow-up [10]. Shava also reported a case of effective conservative treatment after 4 weeks of follow-up [4] and suggested that the reduction in size of the hematomas and the lack of other symptoms indicating pseudoaneurysm rupture are encouraging signals during conservative treatment [4]. No consensus on recommendations for the management of IHPA exists due to the small number of clinical cases.

The selection of conservative or interventional therapies may be difficult for patients diagnosed with IHPA, particularly those who present with bleeding symptoms. The current case was characterized by symptoms of biliary bleeding. We opted for conservative treatment for the following reasons: first, the infection was manageable and bleeding was not extensive as described; second, the patient could be closely monitored, and the lesion could be actively evaluated by CT imaging; third, the patient could easily be treated with surgical or vascular intervention at our center if conservative treatment fail. Of note, IHPA presented only on the second CT and not the first one at the time of trauma. This suggests that there exist cases of IHPA appearing later on after the initial presentation of liver injury. If there is no second CT, which is true in most liver

trauma cases, these IHPA could pass undiagnosed and regress silently. This provokes the thinking that conservative treatment in a clinically stable patient is a valid option. CT imaging performed 36 days after injury revealed that the parenchymal hematoma had decreased in size ($28 \times 29 \times 22 \text{ mm}^3$) indicating the recovery of the liver parenchyma. The child no longer exhibited any gastrointestinal bleeding symptoms, indicating that the treatment course was favorable. At the 18-month follow-up after the injury, CT imaging confirmed the successful outcome of conservative treatment.

Conclusion

Post-traumatic intrahepatic pseudoaneurysm is a rare complication for which no specific treatment guidelines exist. Close monitoring of clinical symptoms and lesion progression using imaging are necessary to ensure appropriate treatment is selected for each individual case. Conservative treatment is effective and should be considered in certain cases.

Availability of data and materials

Data sharing is not applicable to this article as no datasets were generated or analyzed during the current study.

Authors' contributions

All authors read and approved final version of this manuscript.

Ethics approval

Not applicable.

Patient consent

Written informed consent was obtained from the patient for the publication of patient information in this article.

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