

## Transcatheter Arterial Embolization of a Posttraumatic Hepatic Pseudoaneurysm

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### Abstract

Post-traumatic intra-abdominal haemorrhage is a major cause of morbidity and mortality in children. Endovascular arterial embolization is a recognised interventional radiology technique used to treat these active haemorrhages. We report the case of a 12-year-old adolescent admitted to the paediatric surgical emergency department in Rabat, Morocco, for management of grade III hepatic fracture complicated with a pseudoaneurysm of the right hepatic artery managed by Transcatheter Arterial Embolization (TAE). Haemostasis was successfully achieved without complications and the patient had a good post-operative outcome after 5 years. The management of hepatic trauma must be multidisciplinary, involving surgeons, interventional radiologists, emergency physicians and intensive care physicians.

**Keywords:** Pseudoaneurysm; Hepatic fracture; Transcatheter arterial embolization; Children

### Introduction

The post-traumatic intra-abdominal haemorrhage caused by blunt hepatic injury is a major cause of morbidity and mortality [1].

Non-surgical approaches have demonstrated effectiveness in treating individuals with mild liver damage in children [2]. However, this treatment hasn't demonstrated the same level of effectiveness in individuals with severe liver injury, often necessitating surgical procedure. A significant challenge in managing these patients lies in the limitations of CT imaging, which doesn't adequately reveal vascular liver injuries responsible for hemorrhaging, crucial for prompt hemostasis. Recently, Transcatheter Arterial Embolization (TAE) has emerged as an effective approach for patients experiencing blunt hepatic trauma and subacute hepatic fracture [3,4]. We report a successful transcatheter arterial embolization in a 12 years old patient with hepatic pseudoaneurysm.

### Case Presentation

A 12-year-old teenager admitted with an abdominal blunt caused by a handlebar blow (bicycle). Initially, the patient was

hemodynamically stable and his hemoglobin was 11.1 g/dL. He underwent monitoring, placement of a nasogastric tube and urinary catheter (urine output monitoring), fluid resuscitation. The initial abdominal CT revealed a grade III hepatic fracture, a fracture of the cephalic portion of the pancreas and a large hemoperitoneum (Figure 1).



Figure 1: CT scan showing our patient's grade III liver fracture.

We opted initially for a conservative non-operative treatment. At the 8th day follow-up, the patient developed a digestive haemorrhage with the onset of hemodynamic instability and increased transfusion requirements, necessitating admission to the intensive care unit where the patient was stabilized before undergoing an abdominal angio CT, which revealed a pseudoaneurysm of the right hepatic artery (**Figure 2**), the reason for performing a Transcatheter Arterial Embolization (TAE) (**Figure 3**). Haemostasis was successfully achieved without complications and the patient had a good post-operative outcome after 5 years.



Figure 2: CT angiography showing the hepatic pseudoaneurysm.



Figure 3: Angiography showing the pseudoaneurysm before (A) and after (B) the transcatheter embolization.

## Discussion

The non-operative management is considered as the primary approach for treating paediatric trauma because of advancements in resuscitation techniques, diagnostic imaging, paediatric intensive care facilities and the increased use of interventional radiology [5,6].

Emergency physicians need to recognize that managing hepatic injury in children shouldn't rely solely on physiological responses. Children exhibit robust physiological compensatory mechanisms; their blood pressure drops significantly later in the course of more severe bleeding compared to adults [11]. Thus, the decision regarding hemostasis should precede the deterioration of circulatory dynamics. In our case, the patient displayed ongoing signs of hemorrhage, including decreasing hemoglobin levels and developing hemodynamic compromise. A suspected bleeding case must be confirmed with imaging to accurately determine if the source is arterial or venous before choosing the most suitable treatment. In urgent situations, CT angiography is particularly helpful for pinpointing the bleeding vessel, which assists in the embolization process and minimizes radiation exposure. However, not all detected bleedings, such as mild intrafascial hemorrhages or small intraparenchymal pseudoaneurysms, justify embolization, unless they cause

hemodynamic instability or necessitate continuous blood transfusions. Many arterial bleeding cases can spontaneously resolve without intervention. Although contrast-enhanced ultrasound is increasingly used to diagnose post-traumatic injuries in children because it does not involve ionizing radiation, it lacks the comprehensive view provided by CT angiography, which is essential for planning embolization. The most common reasons for embolization in pediatric patients are related to traumas of the liver and the spleen. Embolization is regarded as the standard treatment for arterial bleeding caused by trauma, spontaneous events, and iatrogenic arterial bleeding, even though research on its use in children is still limited [8].

The decision to proceed with embolization should be a collaborative one, made collectively by the interventional radiologists, surgeons, and anesthetists, with the aim to determine the quickest and most effective method to halt bleeding [7]. Transarterial Embolization (TAE) may precede or follow laparotomy to achieve complete hemostasis [7].

Nevertheless, pediatric experiences with TAE are scarce, documented primarily in occasional case series. Performing this procedure in younger patients poses greater technical challenges due to the smaller size of the affected arteries. Potential complications arising from embolization and angiography in children resemble those in adults, encompassing issues such as arterial injury related to catheter or guidewire usage, hematomas at arterial puncture sites, organ ischemia at the intended target, contrast-induced nephropathy, and unintended embolization in non-target organs [12].

The clinical results of embolization for immediate arterial bleeding due to trauma are outstanding, demonstrating high levels of technical and clinical success along with minimal rates of complications and death [9,10].

For our case, we opted for transcatheter embolization due to the emergence of a pseudoaneurysm of the right hepatic artery revealed by abdominal CT angiography. The progression was favorable without the appearance of complications, demonstrating the effectiveness of this treatment.

## Conclusion

Endovascular embolization of acute abdominal haemorrhage of hepatic origin is the treatment of choice. However, adequate clinical and therapeutic follow-up is necessary to reduce long-term mortality, particularly in patients with impaired clinical status.

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