Case Report

J Korean Soc Radiol 2023;84(6):1408-1413
https://doi.org/10.3348/jksr.2023.0045
eISSN 2951-0805

JOURNAL of THE KOREAN SOCIETY of RADIOLOGY

Recurrent Post-Traumatic Adrenal Bleeding after Transcatheter Arterial Embolization: A Case Report

외상성 부신 손상에 대한 경카테터 동맥 색전술 후 재발성 출혈: 증례 보고

Hyojoo Kim, MD, Sang Hyun Seo, MD, Hyun Seok Jung, MD*

Department of Radiology, Wonkwang University Hospital, Wonkwang University College of Medicine, Iksan, Korea

ORCID iDs
Hyojoo Kim https://orcid.org/0000-0002-8280-4381
Sang Hyun Seo https://orcid.org/0000-0003-0708-4051
Hyun Seok Jung https://orcid.org/0000-0002-8408-5288

Received April 24, 2023
Revised June 6, 2023
Accepted June 30, 2023

***Corresponding author**
Hyun Seok Jung, MD
Department of Radiology,
Wonkwang University Hospital,
Wonkwang University
College of Medicine,
895 Muwang-ro,
Iksan 54538, Korea.

Tel 82-63-859-1920
Fax 82-63-851-4749
E-mail bighiva@hanmail.net

Adrenal gland trauma is uncommon and is diagnosed at an increasing frequency using CT scans. However, owing to the rarity of this injury and its diverse clinical presentations and prognoses, there is no consensus on its management. In this case report, a 73-year-old male patient experienced recurrent bleeding in the right adrenal gland due to an in-car traffic accident, which was treated with repeated transcatheter arterial embolization.

Index terms Adrenal Glands; Embolization, Therapeutic; Hemorrhage; Trauma

INTRODUCTION

Traumatic adrenal injury is relatively rare because of the small size and location of the adrenal glands, which are located deep within the retroperitoneum and surrounded by other soft tissue organs. Trauma to the adrenal gland is reported in 0.15%–4% of blunt abdominal trauma (1, 2).

Acute hemorrhage due to adrenal trauma may cause unexpected blood loss, resulting in shock and mortality (3). Previous studies have reported diverse clinical presentations and prognoses of adrenal gland hemorrhages; however, there are no clear guidelines for its management. Furthermore, there have been no case reports of repeated embolization for recur-

rent adrenal bleeding after blunt trauma.

This case report describes a patient who underwent two sessions of transcatheter arterial embolization (TAE) to treat recurrent bleeding in the adrenal gland following an in-car traffic accident.

CASE REPORT

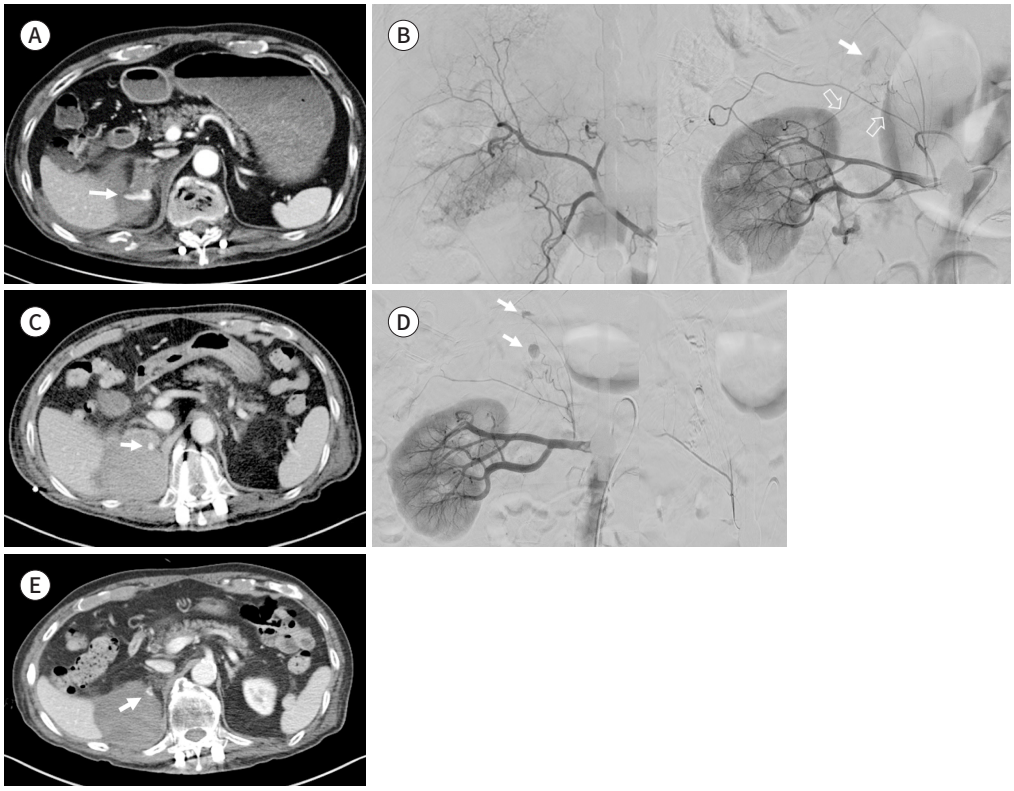
A 73-year-old male presented to the emergency department after an in-car traffic accident. Abdominal CT performed at another hospital revealed a hematoma, contrast extravasation in the posterior aspect of the right lobe of the liver, laceration, and contrast extravasation in the right kidney (Fig. 1A). Chest CT findings indicated multiple injuries, including a left clavicular fracture, multiple rib fractures, and lung contusion. The patient was then transferred to our hospital for further management. Initial laboratory examination revealed a low hemoglobin (Hb) level of 7.9 g/dL. The patient was conscious and had borderline stable vital signs, with a blood pressure of 90/60 mmHg and a heart rate of 84 beats per minute. TAE is the preferred treatment option for patients with hepatic and renal bleeding.

Access was achieved via a right common femoral artery puncture under ultrasonographic guidance, and a 6-Fr vascular sheath was inserted. Hepatic arteriography was performed using a 5-Fr RH catheter (Cook Medical, Bloomington, IN, USA), and multiple contrast blushes were observed in the right hepatic artery, suggestive of a hepatic contusion (Fig. 1B). Embolization was performed using 710–1000 μm gelatin sponge particles (GSP) (Cali-Gel®; Alicon Pharm Sci & Tec Co. Ltd., Hangzhou, China) via microcatheter (Progreat 2.0 Fr; Terumo, Tokyo, Japan) for segment 6 of the hepatic artery. No abnormal findings were observed on selective right renal arteriography. Contrast-enhanced extravasation was observed in a branch of the right renal capsular artery originating from the renal artery that supplies the adrenal glands (Fig. 1B). Embolization was performed using a 710–1000 μm GSP via a microcatheter (Progreat 2.0 Fr; Terumo) for the branch of the right renal capsular artery. A follow-up right renal arteriography revealed no extravasation.

After the initial TAE and transfusion of nine packs of red blood cells and five packs of fresh frozen plasma, the Hb levels remained stable. However, on the 14th day, the patient showed a reduction in Hb levels from 11 g/dL to 9.1 g/dL. Follow-up abdominal CT revealed a viable right adrenal gland parenchyma with a persistent hematoma and multiple well-defined contrast pools inside the hematoma, indicating multiple pseudoaneurysms and recurrent active bleeding (Fig. 1C). Therefore, a secondary TAE was performed.

Access was obtained through a right common femoral artery puncture under ultrasonographic guidance and a 6-Fr vascular sheath was inserted. Selective arteriography of the right renal artery was performed using an RH catheter. No abnormalities were observed in the embolized right renal capsular artery. However, multifocal pseudoaneurysms and contrast extravasation were detected in the right inferior adrenal arteries originating from the renal artery (Fig. 1D). Therefore, selection was made through the common trunk of the right inferior adrenal artery using a microcatheter (Progreat 2.0 Fr; Terumo), and embolization was performed using 500–710 μm polyvinyl alcohol (PVA) particles (Contour; Boston Scientific, CA, USA). A follow-up right renal arteriography revealed no abnormalities.

Fig. 1. Recurrent post-traumatic adrenal bleeding in a 73-year-old male patient treated with TAE.
A. Contrast-enhanced CT image shows a hematoma and contrast extravasation (arrow) in the posterior aspect of the right lobe of the liver.
B. During initial TAE. Celiac arteriography shows multiple contrast blushes in the right hepatic artery, suggesting a hepatic contusion (left). Super selective angiography image shows contrast extravasation (white arrow) in the right renal capsular artery (blank arrows) originating from the renal artery (right). Contrast extravasation was no longer visible after embolization with the gelatin sponge particles (not shown).
C. An abdominal CT taken on the 14th day reveals an existing hematoma and contrast pooling (arrow), suggesting a pseudoaneurysm (portal phase).
D. During secondary TAE, multifocal pseudoaneurysms (arrows) are newly detected in the right inferior adrenal arteries originating from the renal artery (left). Embolization was performed using polyvinyl alcohol particles. Post-embolization angiography reveals complete occlusion of the pseudoaneurysm (right).
E. On follow-up abdominal CT after the second procedure, the right adrenal hematoma is still visible, and a newly developed pseudoaneurysm is observed (arrow). However, no additional procedures were performed because of stable laboratory findings and vital signs.
TAE = transcatheter arterial embolization



On follow-up abdominal CT performed on the fourth day after the second embolization, the right adrenal hematoma remained visible, and a newly developed, small, well-defined, multilobulated contrast pooling was observed, which was suspected to be a pseudoaneurysm (Fig. 1E). However, as there was no decrease in Hb levels on laboratory testing, and vital signs were stable, the patient was discharged without additional procedures.

This retrospective study was approved by the institutional review board of Wonkwang University Hospital (IRB No. 2023-03-021).

JOURNAL of
THE KOREAN SOCIETY of
RADIOLOGY

DISCUSSION

Adrenal gland injuries are rare and modern medical advancements have led to an increase in the number of cases diagnosed (3). The incidence of adrenal gland injury after blunt trauma has steadily increased over the years, with reported rates ranging from 0.04%–0.24% in studies conducted in the 1990s to 0.44%–2.4% in more recent studies. This could be attributed to the widespread use of whole-body CT in patients with traumatic injuries and improvements in the resolution of CT scanners (3, 4).

CT can reveal several findings associated with adrenal gland trauma, including the most common adrenal hematomas, irregular hemorrhages that can obliterate the glands, uniform adrenal gland swelling with increased attenuation, periadrenal hemorrhages or stranding, retroperitoneal hemorrhages, chronic adrenal pseudocysts, and rarely, active extravasation (2).

Three theories have been proposed to potentially explain the mechanisms of traumatic adrenal injury (6). The first theory is that adrenal injury is a result of inferior vena cava compression during an abdominal impact, causing an acute increase in intra-adrenal venous pressure, which may explain why the right adrenal gland is more commonly affected. The incidence of adrenal gland injury is higher on the right side than on the left or both sides. In a previous study, blunt adrenal gland injuries occurred on the right side in 72.8% of cases, on the left side in 19.9%, and bilaterally in 7.3% (5). The second theory on the mechanisms of adrenal injury is the crushing of the adrenal glands between the spine and surrounding solid organs. The third theory suggests that deceleration forces may shear the sinusoidal network of the small arterioles of the adrenal glands, resulting in shearing injury (6).

Active adrenal bleeding is uncommon, ranging from 1%–6% (2). Trauma to the adrenal glands is frequently associated with other injuries, particularly those involving the liver or ribs. Previous reports have suggested that adrenal gland trauma is associated with an increased injury severity score or mortality; however, more recent studies have suggested that adrenal bleeding is not associated with increased morbidity or an elevated mortality rate (5).

There are no clear guidelines for the management of adrenal gland injury. Treatment planning is based on the severity of associated injuries rather than on the degree of adrenal gland injury. Conservative treatment is usually the first-line approach, and surgical or interventional treatment is considered in cases of arterial bleeding with hemodynamic instability (7, 8). Interventional treatment is a more appropriate option, especially in cases with a significant risk of complications associated with general anesthesia or when surgical access is challenging.

TAE has been increasingly reported in recent years as a noninvasive and effective treatment option for adrenal gland trauma (7). TAE for adrenal injuries is challenging due to the rich vascularity of the adrenal glands and variations in the origin of their blood supply. The glands are supplied by three arteries: the superior, middle, and inferior adrenal arteries, which can arise from different arteries such as the inferior phrenic artery, aorta, and renal artery. The adrenal parenchyma is small and has good internal vascular communication; therefore, embolization of a single artery is unlikely to result in infarction of the entire gland (1). To date, there have been no reports of adrenal infarction or insufficiency following TAE for adrenal gland trauma.

Currently, there is no published research on the recurrence rate of adrenal bleeding and

there are no case reports on the recurrence in English literatures. Although rebleeding cannot be ruled out because of the rich vascular network of the three adrenal arteries, a full routine evaluation of all arteries during TAE is considered unnecessary and time-consuming if the patient is hemodynamically stable.

In this case report, the patient experienced recurrent bleeding of the adrenal artery from a traumatic adrenal injury, even after undergoing embolization using a GSP approximately two weeks prior. There are two possible causes of rebleeding. First, rich collateral blood supply to the adrenal glands may have contributed to this finding. In upper gastrointestinal bleeding, TAE is associated with a higher risk of rebleeding owing to the rich collateral blood supply (9). Second, the choice of embolic agent may have been a contributing factor. The first embolization used GSP, which has a temporary angio-occlusive effect typically lasting 3–6 weeks, and may have contributed to rebleeding (4). However, since bleeding was confirmed in different branches on the first and second angiographies, and rebleeding was observed on CT after the second TAE using PVA, the second possibility is considered less likely.

To conclude, this report presents a case of rebleeding in the right adrenal gland after two sessions of TAE for bleeding caused by an in-car traffic accident. Although post-traumatic adrenal gland bleeding is rare, TAE is the preferred treatment method; however, rebleeding may occur thereafter. Therefore, in patients who undergo TAE for post-traumatic adrenal gland bleeding, follow-up with enhanced CT or angiography is necessary if there are signs of persistent bleeding, such as decreased Hb and unstable vital signs.

Author Contributions

Conceptualization, J.H.S.; formal analysis, K.H.; investigation, K.H., S.S.H.; supervision, J.H.S.; writing—original draft, K.H.; and writing—review & editing, J.H.S.

Conflicts of Interest

The authors have no potential conflicts of interest to disclose.

Funding

None

REFERENCES

1. Fowler AM, Burda JF, Kim SK. Adrenal artery embolization: anatomy, indications, and technical considerations. *AJR Am J Roentgenol* 2013;201:190-201
2. To'o KJ, Duddalwar VA. Imaging of traumatic adrenal injury. *Emerg Radiol* 2012;19:499-503
3. Liao CH, Lin KJ, Fu CY, Wang SY, Yang SJ, Ouyang CH. Adrenal gland trauma: is extravasation an absolute indication for intervention? *World J Surg* 2015;39:1312-1319
4. DiGiacomo JC, Gerber N, Angus LDG, Munnangi S, Cardozo-Stolberg S. Blunt adrenal injury: results of a state trauma registry review. *Am Surg* 2019;85:390-396
5. DiGiacomo JC, Gerber N, Angus LDG, Munnangi S, Cardozo-Stolberg S. Acute traumatic injuries of the adrenal gland: results of analysis of the Pennsylvania trauma outcomes study registry. *Trauma Surg Acute Care Open* 2020;5:e000487
6. Chernyak V, Patlas MN, Menias CO, Soto JA, Kielar AZ, Rozenblit AM, et al. Traumatic and non-traumatic adrenal emergencies. *Emerg Radiol* 2015;22:697-704
7. Lee YS, Jeong JJ, Nam KH, Chung WY, Chang HS, Park CS. Adrenal injury following blunt abdominal trauma. *World J Surg* 2010;34:1971-1974
8. Liao CH, Ouyang CH, Fu CY, Wang SY, Lin KJ, Kuo IM, et al. The current status and management of blunt ad-

renal gland trauma. *Surgery* 2015;157:338-343
9. Beggs AD, Dilworth MP, Powell SL, Atherton H, Griffiths EA. A systematic review of transarterial embolization versus emergency surgery in treatment of major nonvariceal upper gastrointestinal bleeding. *Clin Exp Gastroenterol* 2014;7:93-104

외상성 부신 손상에 대한 경카테터 동맥 색전술 후 재발성 출혈: 증례 보고

김효주 · 서상현 · 정현석*

외상성 부신 손상은 드물게 나타난다고 알려져 있으며, 최근 외상 환자에서 컴퓨터단층촬영 사용 빈도가 증가함에 따라 그 발견 빈도가 증가하고 있다. 그러나 손상의 희귀성, 임상적 표현과 예후의 다양성으로 인하여 부신 외상의 치료에 대한 명확한 지침은 형성되지 않았다. 본 증례 보고에서는 차량 사고로 인하여 재발성 우측 부신 출혈을 경험하였으며 이에 대하여 반복적인 경카테터 동맥 색전술을 이용하여 치료한 73세 남성 환자에 대하여 보고하고자 한다.

원광대학교 의과대학 원광대학교병원 영상의학과