



Percutaneous Transhepatic Embolization for Isolated Pancreaticoduodenal Vein Rupture in Blunt Abdominal Trauma: A Case Report

복부 외상에서 발생한 이자샘창자 정맥 파열의 피부간경유 색전술

Hoon Kwon, MD¹, Chang Won Kim, MD¹, Chang Ho Jeon, MD¹, Kwang Hee Yeo, MD^{2*},
Dongsub Noh, MD³, Chan Kyu Lee, MD²

Departments of ¹Radiology, ²Trauma Surgery, Pusan National University Hospital, Busan, Korea

³Department of Trauma Surgery, Daejeon Eulji Medical Center, Eulji University, Daejeon, Korea

In blunt abdominal trauma, the prevalence of superior mesenteric vein injury or portal vein injury is low and surgical treatment is often difficult. We report a case of percutaneous transhepatic embolization in a patient who experienced isolated rupture of the pancreaticoduodenal vein (PDV). The patient sustained abdominal trauma in a motorcycle accident. A pseudoaneurysm was suspected in the anterior pancreatic head based on the portal venous phase of computed tomography. However, the lesion was not observed on celiac arteriography and superior mesenteric arteriography. PDV rupture was detected by additional percutaneous transhepatic superior mesenteric venography, and embolization was performed by trapping the PDV. This procedure is a safe, minimally invasive method that can be performed in patients with injuries of the portal venous system accompanying abdominal trauma; this procedure effectively reduces the need for invasive surgery.

Index terms

Abdominal Injuries
Portal Vein
Mesenteric Veins
Embolization, Therapeutic

Received June 8, 2017

Revised July 19, 2017

Accepted July 26, 2017

*Corresponding author: Kwang Hee Yeo, MD
Department of Trauma Surgery, Pusan National University
Hospital, 179 Gudeok-ro, Seo-gu, Busan 49241, Korea.
Tel. 82-51-240-7384 Fax. 82-51-254-0192
E-mail: songyu0428@gmail.com

This is an Open Access article distributed under the terms of the Creative Commons Attribution Non-Commercial License (<http://creativecommons.org/licenses/by-nc/4.0>) which permits unrestricted non-commercial use, distribution, and reproduction in any medium, provided the original work is properly cited.

INTRODUCTION

Major vascular injuries present a complex challenge to trauma surgeons and interventional radiologists. Trauma to the portal vein (PV) and the superior mesenteric vein (SMV) is uncommon, and few surgeons have significant experience in treating these injuries (1). A great majority of these patients have an associated vascular injury and the overall mortality rate is high. Due to the technical difficulty in isolating injured vessels, associated abdominal injuries and massive bleeding are the most common causes of death (2). We present a case of blunt abdominal trauma in a patient who sustained an atypical pancreatoduodenal vein (PDV) injury with hemodynamic instability and

was successfully treated with percutaneous transhepatic embolization of the PDV.

CASE REPORT

A 33-year-old male who sustained injury in a motorcycle accident was transferred to our trauma center in a tertiary care hospital due to unstable vital signs and right upper quadrant abdominal pain. His systolic blood pressure was 70 mm Hg on initial physical examination and tachycardia exceeded 120 bpm. Laboratory findings revealed a hemoglobin level of 11.2 g/dL,

hematocrit of 31.9%, and platelet count of 110000/ μ L. Initial focused assessment with sonography in trauma revealed a hemoperitoneum. Contrast enhanced computed tomography (CT) of the abdomen and pelvis also revealed a hemoperitoneum (Fig. 1A, B), and portal venous phase images showed a pseudoaneurysm in the anterior pancreatic head, but arterial phase images showed only increased strands within fatty tissue (Fig. 1C). There were no other abnormalities in the abdominal solid organs or a hollow viscus on CT.

We immediately performed angiography. Celiac angiography and superior mesenteric angiography did not reveal an arterial bleeding focus with contrast extravasation or pseudoaneurysm formation, and no definite lesion was seen on indirect portal venography. Therefore, we decided to perform direct portal venography in consideration of the presence of a pseudoaneurysm on

portal venous CT.

A 21-G Chiba needle (Cook, Bloomington, IN, USA) was used to puncture the peripheral PV (liver segment 5) under ultrasonography and fluoroscopy guidance, and a 0.018-inch guide wire was placed in the PV. A 5 Fr introducer sheath was inserted, and the SMV was selected with a 0.035-inch guide wire. A 5 Fr Cobra catheter (Cook) was placed in the SMV and direct portal venography was performed. However, venous rupture or pseudoaneurysm was not observed. Therefore, venography was performed by selecting the branches of the SMV. Selection of the ruptured vein was based on indirect venography using SMA and CT images, and the location of the PDV was determined. On selective venography, a ruptured venous pseudoaneurysm of the PDV was identified (Fig. 1D). Then, a 2.2 Fr Progreat microcatheter (Terumo, Tokyo, Japan) was used to engage the PDV

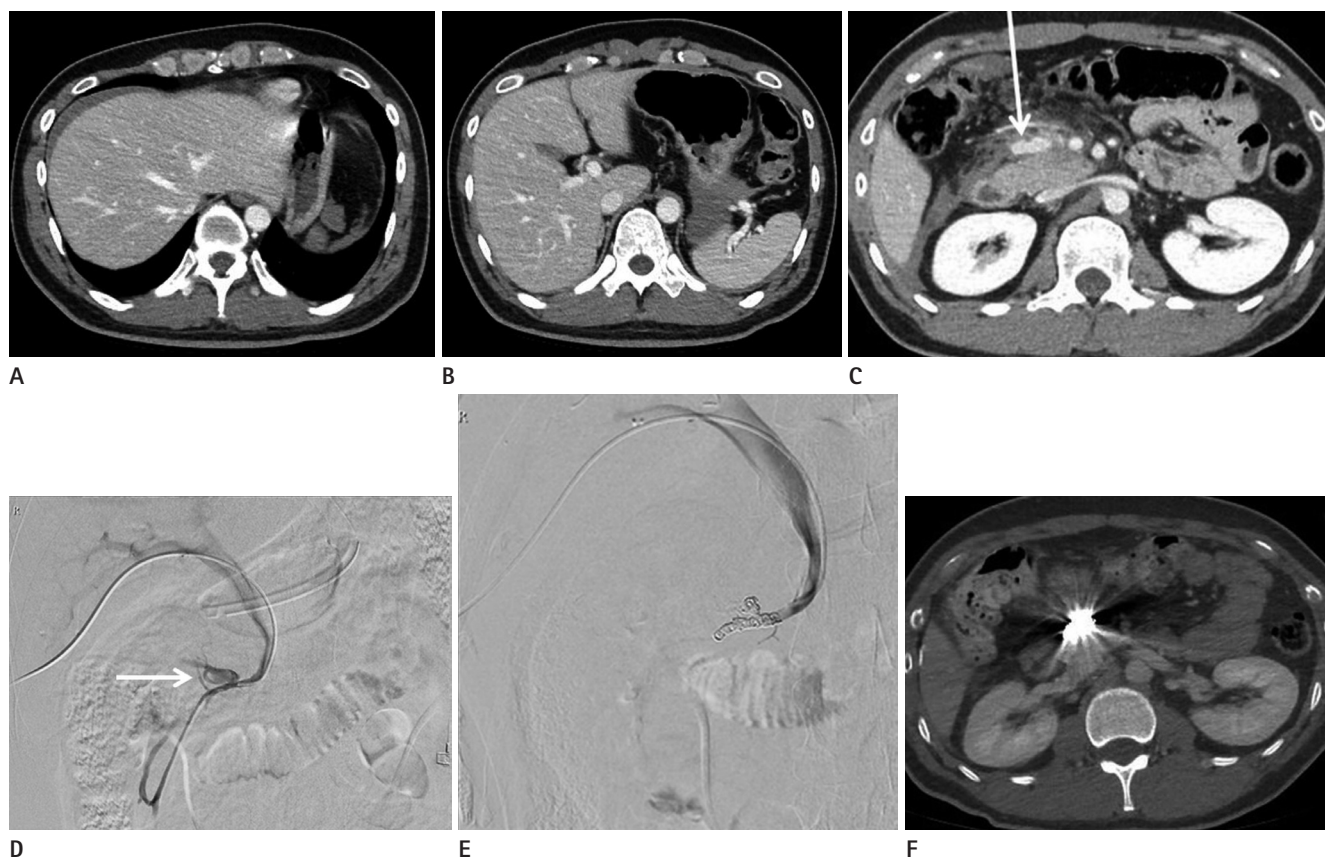


Fig. 1. A 33-year-old male sustained injury in a motorcycle accident. CT revealed a pseudoaneurysm in the anterior pancreatic head. **A, B.** Axial contrast-enhanced CT image demonstrates hemoperitoneum in the perihepatic space and splenic hilum. **C.** The portal venous phase CT image demonstrates a lesion considered to be a pseudoaneurysm in the ventral pancreatic head (arrow). **D.** Selective pancreaticoduodenal venography demonstrates a ruptured venous pseudoaneurysm with contrast extravasation (arrow). **E.** Postembolization venography demonstrates complete exclusion of the pseudoaneurysm and successful filling of the superior mesenteric vein. **F.** Follow-up CT showing the coils in the completely excluded pseudoaneurysm and a patent superior mesenteric vein. CT = computed tomography

and the microcatheter was negotiated through the venous pseudoaneurysm into the normal segment just distal to the pseudoaneurysm. Seventeen Tornado pushable microcoils (Cook) with diameters ranging from 3 to 4 mm were delivered through the microcatheter to embolize the pseudoaneurysm, using the sandwich technique (proximal and distal embolization) to avoid distal reconstitution of the injured vein. Reflux venography was repeated to confirm that the distal flow was blocked. Postembolization venography showed complete exclusion of the pseudoaneurysm and successful filling of the SMV (Fig. 1E). The transhepatic tract was embolized using an N-butyl cyanoacrylate (NBCA; Histoacryl, B Braun, Melsungen, Germany) plus lipiodol (Lipiodol Ultrafluid, Laboratoire Guerbet, Paris, France) mixture at a ratio of 1:1. After the procedure, the patient's systolic blood pressure was restored to 110 mm Hg and the vital signs stabilized. No additional contrast extravasation or hemoperitoneum was observed on follow-up CT after 3 days (Fig. 1F). The patient subsequently underwent surgery for a femoral fracture and was discharged on the 24th day of hospitalization. He is currently doing well, without any evidence or symptoms of traumatic sequelae or postembolization complications, after a follow-up period of 7 months.

DISCUSSION

SMV injuries are rare and incur high mortality. Given their low incidence, little data exist delineating treatment methods. The controversy about repair versus ligation for SMV injuries remains unresolved (3, 4).

Since the development of angiography and transcatheter techniques, interventional radiology has played an important role in the management of trauma patients. The ability to treat life-threatening hemorrhage with transcatheter embolization has reduced the morbidity associated with surgery, and mortality has been reduced by quick access to a bleeding focus with use of angiography techniques (5).

Venous bleeding is considered relatively insignificant compared to arterial bleeding and it often stops spontaneously because of low pressure. However, large vein injuries due to trauma can cause massive bleeding and SMV injuries are highly lethal (3). In this case, the injured vessel was located in the retroperitoneal space, but it resulted in a hemoperitoneum. It is possible

that both the vessels and the peritoneum of the mesenteric root were damaged simultaneously. Therefore, active and rapid intervention is thought to have prevented death and reduced morbidity.

Percutaneous transhepatic catheterization of the PV has been used to safely and accurately evaluate the portal venous system since its introduction in the 1970s (6). The technique is also used in various interventions related to portal hypertension and liver transplantation (7, 8). Additionally, the potential bleeding complications of access tracts can be safely managed through NBCA embolization (9).

An isolated injury to the PDV is extremely rare, and this is the first reported case in which percutaneous transhepatic venous embolization was used to treat a PDV injury. Although there are several treatment options for PDV injury, surgical treatments are accompanied by complications such as pancreatic fistula and intraabdominal abscess (10). In cases of severe pancreatic injury or duodenal rupture, surgical treatment should be given priority; however, if there is only vascular damage, as in this case, percutaneous transhepatic embolization may be a useful alternative minimally invasive treatment.

REFERENCES

1. Fraga GP, Bansal V, Fortlage D, Coimbra R. A 20-year experience with portal and superior mesenteric venous injuries: has anything changed? *Eur J Vasc Endovasc Surg* 2009;37: 87-91
2. Coimbra R, Filho AR, Nesser RA, Rasslan S. Outcome from traumatic injury of the portal and superior mesenteric veins. *Vasc Endovascular Surg* 2004;38:249-255
3. Asensio JA, Petrone P, Garcia-Nuñez L, Healy M, Martin M, Kuncir E. Superior mesenteric venous injuries: to ligate or to repair remains the question. *J Trauma* 2007;62:668-675; discussion 675
4. Donahue TK, Strauch GO. Ligation as definitive management of injury to the superior mesenteric vein. *J Trauma* 1988;28: 541-543
5. Gould JE, Vedantham S. The role of interventional radiology in trauma. *Semin Intervent Radiol* 2006;23:270-278
6. Burcharth F. Percutaneous transhepatic portography. I. technique and application. *AJR Am J Roentgenol* 1979;132:

177-182

7. Adani GL, Baccarani U, Risaliti A, Sponza M, Gasparini D, Bresadola F, et al. Percutaneous transhepatic portography for the treatment of early portal vein thrombosis after surgery. *Cardiovasc Intervent Radiol* 2007;30:1222-1226
8. Tian X, Wang Q, Zhang C, Liu F, Cui Y, Liu F, et al. Modified percutaneous transhepatic variceal embolization with 2-oc-tylcianoacrylate for bleeding gastric varices: long-term follow-up outcomes. *AJR Am J Roentgenol* 2011;197:502-

509

9. Park SY, Kim J, Kim BW, Wang HJ, Kim SS, Cheong JY, et al. Embolization of percutaneous transhepatic portal venous access tract with N-butyl cyanoacrylate. *Br J Radiol* 2014; 87:20140347
10. Choi SB, You J, Choi SY. A case of traumatic pancreaticoduodenal injury: a simple and an organ-preserving approach as damage control surgery. *JOP* 2012;13:76-79

복부 외상에서 발생한 이자샘창자 정맥 파열의 피부간경유 색전술

권 훈¹ · 김창원¹ · 전창호¹ · 여광희^{2*} · 노동섭³ · 이찬규²

복부 외상에서 상장간막정맥이나 간문맥의 파열빈도는 낮은 편이며 이에 대한 수술적 치료 역시 어려운 경우가 많다. 이 논문에서는 복부 외상으로 인해 이자샘창자 정맥 파열이 있던 환자에서 피부간경유 색전술을 시행하여 성공적인 결과를 얻었기에 이에 대한 증례를 보고하고자 한다. 증례의 환자는 오토바이 교통사고로 인한 복부 외상을 수상하였으며 CT상에서 췌장 앞쪽으로 가성동맥류가 의심되어 혈관조영술을 시행하였으나 복강동맥과 상장간동맥 조영술에서 병변을 찾을 수 없었다. 추가적인 피부간경유 정맥조영술을 통해 상장간정맥에서 분지하는 이자샘창자 정맥 파열을 발견하여 코일 색전술을 시행하였다. 이 기술은 복부외상에 동반된 문맥계통 손상 환자에서 시행할 수 있는 안전하고 최소 침습적인 방법으로 침습적인 수술의 빈도를 낮출 수 있는 효과적인 치료방법이라 할 수 있다.

부산대학교병원 ¹영상의학과, ²외상외과, ³울지대학교병원 외상외과