

Stable fracture of the pubic rami: a rare cause of life-threatening bleeding from the inferior epigastric artery managed with transcatheter embolization

Romaric Loffroy, MD;* Jean-Michel Yeguiayan, MD;† Boris Guiu, MD;* Jean-Pierre Cercueil, MD;* Denis Krausé, MD*

ABSTRACT

Extraperitoneal bleeding from the inferior epigastric artery (IEA) and its branches is a rare complication of blunt pelvic trauma; however, it can result in life-threatening hemorrhage, even in cases of minimally displaced fractures of the pelvic ring. We report the case of a patient who had post-traumatic pelvic hematoma and cardiovascular collapse caused by avulsion of the right pubic branch of the IEA related to undisplaced fractures of the pubic rami. CT scanning followed by angiography showed leakage of contrast from the IEA. Transcatheter arterial embolization was performed to successfully control the hemorrhage. There have been very few previous reports of IEA injury related to stable fractures of the pubic rami successfully treated by transcatheter arterial embolization.

Keywords: pelvic fracture, hemorrhage, CT, transcatheter embolization

RÉSUMÉ

Le saignement rétro-péritonéal de l'artère épigastrique inférieure (AEI) et de ses branches est une complication rare d'un traumatisme pelvien fermé qui peut cependant occasionner une hémorragie potentiellement mortelle, même dans le cas de fractures avec déplacement minimal de l'anneau pelvien. Ce rapport décrit le cas d'un patient présentant un hématome pelvien post-traumatique et un collapsus cardio-vasculaire consécutif à une fracture-avulsion de la branche pubienne droite de l'artère épigastrique inférieure associée à des fractures sans déplacement des branches pubiennes. La tomодensitométrie suivie d'une angiographie ont révélé une fuite du produit de contraste au niveau de l'AEI. Une embolisation artérielle par cathéter a été réalisée pour stopper l'hémorragie. À ce jour, on signale très peu de cas de lésions de l'AEI associées à des fractures stables des branches pubiennes qui ont été traitées avec succès par embolisation artérielle par cathéter.

Introduction

Massive extraperitoneal hemorrhage from the inferior epigastric artery (IEA) and its branches is a rare yet well-documented complication of blunt pelvic trauma resulting in unstable pelvic ring fractures. In contrast, only 2 cases of life-threatening bleeding due to stable fractures of the

pubic rami have been reported.¹⁻³ Most cases of stable fractures of the pubic rami do not require surgical fixation, and arterial embolization may be a safe alternative to surgery when arterial bleeding causes hemodynamic instability. The diagnosis is often established through a CT scan, which shows evidence of ongoing hemorrhage and may disclose other intra-abdominal injuries. We report the case

From the Departments of *Diagnostic and Therapeutic Imaging, and †Anesthesiology and Intensive Care, University of Dijon School of Medicine, Bodge Teaching Hospital, Dijon, France

Submitted Aug. 3, 2007; Revised Nov. 17, 2007; Accepted Dec. 11, 2007

This article has been peer reviewed.

CJEM 2008;10(4):392-5

of a massive posttraumatic pelvic hematoma with cardiovascular collapse caused by avulsion of the right pubic branch of the IEA in a patient with minimally displaced fractures of the pubic rami.

Case report

An 83-year-old man was admitted to hospital with hemodynamic instability. He had sustained abdominal and pelvic injuries during a low-energy lateral motor vehicle collision while driving with his seat belt on. He complained of acute pain in the lower abdomen, and physical examination revealed an anterior lower abdominal mass. He had a history of atrial flutter and was taking oral anticoagulant therapy (acenocoumarol) at a dosage of 4 mg/day. His blood pressure was 92/61 mm Hg and his pulse was irregular at 115 beats/minute. On admission to the emergency department (ED), his hemoglobin level was 105 g/L, platelet count was $90 \times 10^9/L$ and the international normalized ratio (INR) was 2.5. Crystalloid fluids resuscitation and blood transfusion were initiated allowing the hemodynamic parameters to

stabilize temporarily. Multislice CT of the head, thorax, abdomen and pelvis was performed immediately. Images were acquired before and after intravenous injection of 120 mL of contrast medium at a rate of 2.5 mL/second. A large hematoma with signs of active bleeding in the right side of the pelvis was seen (Fig. 1). There was no evidence of visceral injury. The CT scan also showed minimally displaced fractures of both pubic rami on the right (Fig. 2). During the next 10 minutes, the patient's hemoglobin level dropped to 82 g/L and he experienced persistent hypovolemic clinical shock (blood pressure of 70/40 mm Hg, pulse rate of 110 beats/min, mottling, abdominal pain) despite transfusion of 3 units of packed red blood cells and volume replacement. This prompted a pelvic angiography via the common femoral artery using a 6-French sheath placed in the groin. A retrograde right internal and external iliac arteriography was performed using a 5-French vertebral catheter (Cordis Corp.), and revealed isolated leakage of contrast medium out of the pubic branch of the right inferior epigastric artery (Fig. 3). Selective embolization of the IEA, necessitating a contralateral femoral arterial approach, was performed using a coaxial 2.9-French microcatheter (0.025 Progreat,

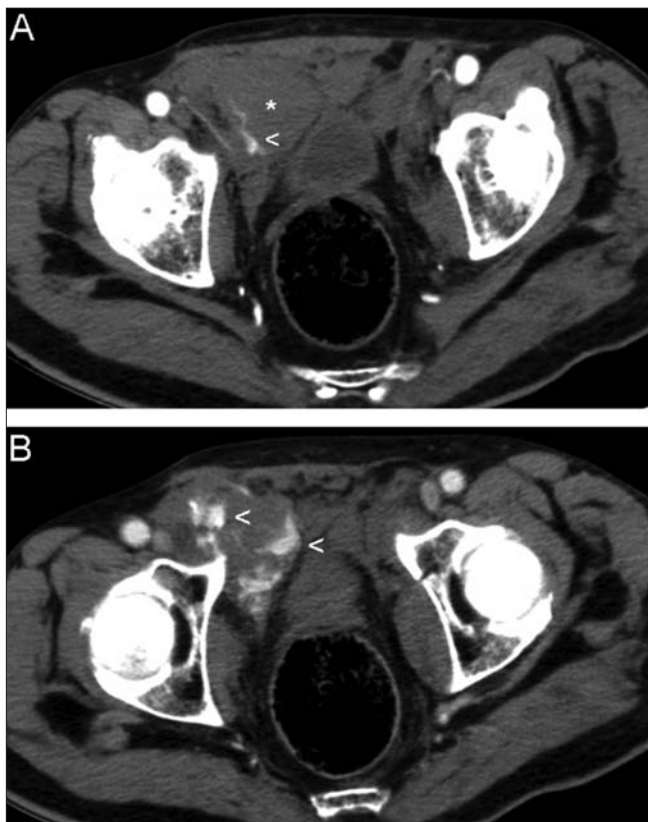


Fig. 1. Contrast-enhanced multislice CT scan showing a large pelvic hematoma on the right side displacing the bladder posteriorly (A) (asterisk), with blood extravasation (B) (arrowheads) from the inferior epigastric artery, which is visualized (A).

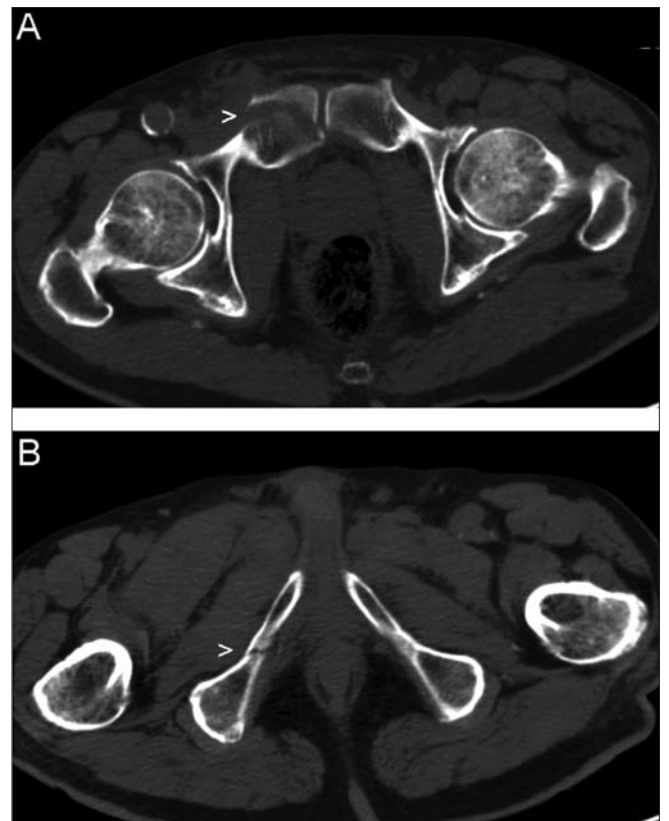


Fig. 2. CT scan of the pelvis using a bony window: fractures of the superior (A) and inferior (B) pubic rami without significant displacement (arrowheads).

Terumo Corp.), which was inserted coaxially through a 5-French standard catheter. A 3:1 mixture of n-butyl cyanoacrylate glue (Histoacryl, B. Braun Medical Inc.) and Lipiodol Ultra-Fluid (Therapex/E-Z-EM Inc.) was inserted to selectively occlude the bleeding vessel. The bleeding stopped and the patient's hemodynamic parameters stabilized (Fig. 3). The patient survived the immediate postprocedural period and was discharged from hospital 16 days later.

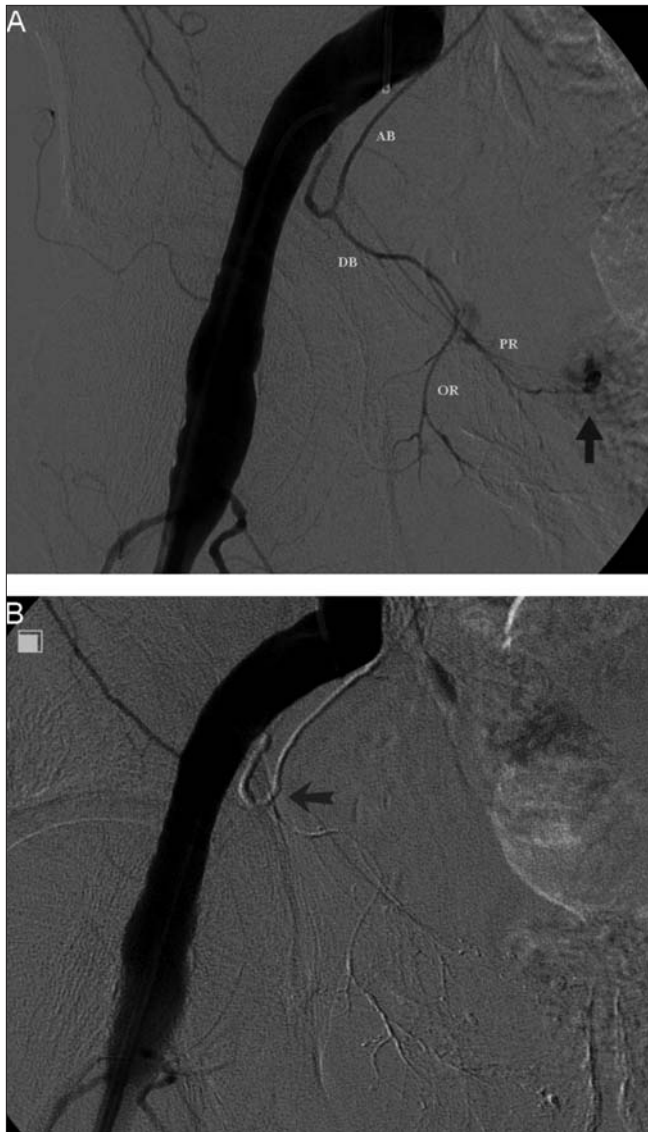


Fig. 3. (A) Transfemoral angiography showing ongoing hemorrhage (extravasation of contrast medium) from 1 of the 2 descending branches (pubic rami) (arrow) of the right inferior epigastric artery (IEA), in front of the fracture of the superior pubic ramus. AB = ascending branch; DB = descending branch; OR = obturator rami; PR = pubic rami. **(B)** After arterial microcatheterization and selective embolization with cyanoacrylate, the right IEA is completely occluded and there is no active bleeding (arrow).

Discussion

The IEA arises from the external iliac artery deep to the inguinal ligament. It both serves as a surgical landmark and constitutes a potential target for injury during inguinal hernia repair. The IEA divides deep to the rectus sheath into 2 branches: an ascending branch that anastomoses at the umbilicus, medial to the rectus sheath, with the abdominal branch (or superior epigastric artery) of the internal thoracic artery; and a descending branch that gives off obturator branches that course along the ischium and anastomose with the obturator artery and pubic branches, which in turn course along the pubic rami and reach the pubic symphysis.⁴ Injuries to the ascending branch are well-documented and usually occur after direct trauma to the abdominal wall, for instance during laparoscopic surgery, subcutaneous injections, insertion of lumboperitoneal shunts or ascites fluid aspiration.⁵⁻⁷ Rarely, the ascending branch may rupture spontaneously, most notably in patients taking anticoagulant medications. Thus tearing of the branches of the epigastric vessels is a well-known cause of rectus sheath hematoma.^{8,9}

In contrast, there have been only 4 previous reports of massive bleeding from the pubic branch of the IEA in patients with nondisplaced pubic rami fractures caused by blunt pelvic trauma.¹⁻³ In our patient, minimally displaced fractures of the right pubic rami were sufficient to cause life-threatening bleeding owing to avulsion of the pubic branch of the IEA. Anticoagulant therapy was a risk factor for severe bleeding in our patient. Two cases of severe bleeding from the IEA were reported after pelvic trauma without fractures,^{10,11} which means that all clinicians should consider the possibility of serious hemorrhage in cases of minor pelvic fractures, and should be especially cautious in patients receiving anticoagulants.

Physical examination identification of a rapidly expanding, painful pelvic mass in a patient with hypovolemia after trauma to the pelvis should suggest this diagnosis. The use of a CT scan can show the exact location of the hematoma, the bleeding site and the minor bony fractures (if any). In addition, a CT scan can rule out any other intra-abdominal injuries potentially requiring emergency surgical treatment. Although some authors advocate the use of angiography as the first choice of investigation in patients with a pelvic fracture and hemodynamic instability,¹² we suggest that a CT scan may be very useful in trauma patients in order to guide embolization, because it is sometimes difficult to attribute hypovolemic shock to this lesion alone in polytrauma patients. However, a CT scan can be performed if the time to transfer an acutely injured and

hemodynamically unstable patient from the scanner to the angiography room is very short, as it is in our institution. In patients with hemodynamic instability and CT evidence of active bleeding, transfemoral angiography should be performed immediately to enable treatment by selective embolization, which is required in about 7%–11% of patients with pelvic fractures.¹² In this case, embolization of the inferior epigastric artery was performed from a contralateral femoral artery puncture. This approach was beneficial because it took place away from the hematoma, which otherwise may have interfered with initial ipsilateral catheterization. This should be the preferred approach.

In this patient, we occluded the whole of the inferior epigastric artery back to its origin, including its ascending branch, rather than the pubic branch alone, to prevent the hematoma from spreading. It was important to perform internal iliac arteriography after embolization in this case to confirm that contrast medium extravasation does not persist via anastomoses with the obturator artery. This procedure stopped the bleeding without causing ischemic complications. We are not aware of previous reports of glue embolization of the IEA after pelvic trauma.

Conclusion

This case report illustrates that even minimally displaced fractures of the pubic rami can cause life-threatening bleeding as a result of injury to the pubic branch of the IEA. This rare cause of severe bleeding should be considered in patients with hypovolemic shock after pelvic trauma. Angiography should be performed on an emergency basis to allow embolization.

Competing interests: None declared.

References

1. Meyers TJ, Smith WR, Ferrari JD, et al. Avulsion of the pubic branch of the inferior epigastric artery: a cause of hemodynamic instability in minimally displaced fractures of the pubic rami. *J Trauma* 2000;49:750-3.
2. Wong TC, Chan WL, Wu WC. Life threatening stable pubic rami fracture. *Injury Extra*. 2005;36:300-2.
3. McDonald DJ, Tollan CJ, Robertson I, et al. Massive haemorrhage after a low-energy pubic ramus fracture in a 71-year-old woman. *Postgrad Med J* 2006;82:e25.
4. Neidhardt JPH. Muscles of the abdomen. In: Chevrel JP, editor. *Clinical anatomy — trunk*. Paris (FR): Springer; 1996. p. 306-33.
5. Hurd WW, Pearl ML, DeLancey JO, et al. Laparoscopic injury of abdominal wall blood vessels: a report of three cases. *Obstet Gynecol* 1993;82:673-6.
6. Samandouras G, Wadley J, Afshar F. Life-threatening intra-abdominal haemorrhage following insertion of a lumboperitoneal shunt. *Br J Neurosurg* 2002;16:192-3.
7. Dumortier J, Poncet G, Belbouab S, et al. Severe hemorrhage from the epigastric after ascites paracentesis. *Gastroenterol Clin Biol* 2002;26:180-1.
8. Miyauchi T, Ishikawa M, Miki H. Rectus sheath hematoma in an elderly woman under anti-coagulant therapy. *J Med Invest* 2001;48:216-20.
9. Basile A, Medina JG, Mundo E, et al. Transcatheter arterial embolization of concurrent spontaneous hematomas of the rectus sheath and psoas muscle in patients undergoing anticoagulation. *Cardiovasc Intervent Radiol* 2004;27:659-62.
10. Wilson CJ, Edwards R. Massive extraperitoneal hemorrhage after soft tissue trauma to the pubic branch of the inferior epigastric artery. *J Trauma* 2000;48:779-80.
11. Baumgartner F, White GH, White RA, et al. Delayed, exsanguinating pelvic hemorrhage after blunt trauma with bony fracture: case report. *J Trauma* 1990;30:1603-5.
12. Ben-Menachem Y, Coldwell DM, Young JWR, et al. Hemorrhage associated with pelvic fractures: causes, diagnosis and emergent management. *AJR Am J Roentgenol* 1991;157:1005-14.

Correspondence to: Dr. Romaric Loffroy, Department of Diagnostic and Therapeutic Imaging, University of Dijon School of Medicine, Bocage Teaching Hospital, 2 bd Maréchal de Lattre de Tassigny, BP 77908, 21079 Dijon cedex, France; romaric.loffroy@chu-dijon.fr