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Case Report

Selective angioembolization in a pelvic fracture patient with refractory bleeding and hemodynamic instability

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ABSTRACT

Angioembolization for hemodynamically unstable patients with pelvic fracture has become the standard of care. However, the selection and extent of contrast of the distal artery in such patients remains undetermined. In this case, an octogenarian man was hit by a truck and was hemodynamically unstable with pelvic fracture. Based on enhanced computed tomography, selective angiography visualized arterial extravasation and the arterial bleeding could be arrested. This approach may be required for the treatment of patients in this setting.

Introduction

Pelvic fracture is a potentially life-threatening injury. The mortality rate associated with this injury remains high, especially in patients with hemodynamic instability [1]. Angioembolization has become the standard of care for hemodynamically unstable patients with pelvic fracture, and is indicated in approximately 3% to 10% cases of pelvic fracture [2]. It was reported that the presence of arterial contrast extravasation in the pelvis and the presence of pelvic hematoma detected through computed tomography (CT) are predictors of the need for angioembolization [1]. Suspected bleeding vessels are generally contrasted based on enhanced CT [3]. However, a negative angiogram is reported in approximately 35% of patients with pelvic fracture. For

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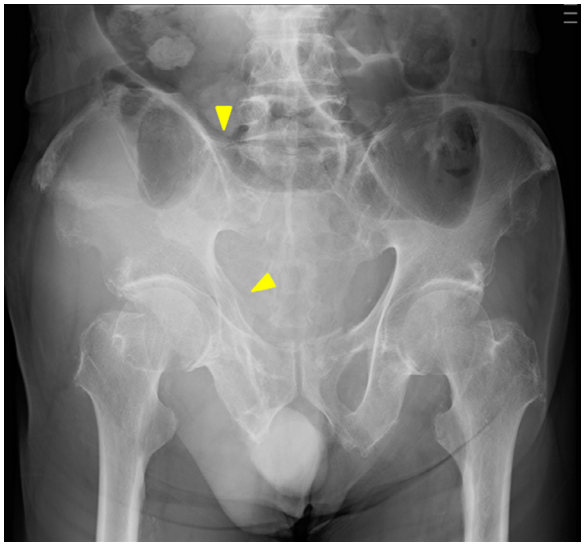

Fig. 1 – Pelvis radiograph at initial presentation. The examination revealed lateral instability of right pelvis and multiple pelvis bone fractures (pubis and ilium; arrowheads).

patients with a negative angiogram, the selection and extent of contrast of the distal artery remains unknown [4–6].

We present a notable case of pelvic fracture with unstable hemodynamics. This case had no obvious arterial extravasation based on the aortogram and selective external iliac artery angiogram. However, an obvious arterial extravasation was visualized through selective contrast of the lateral femoral circumflex artery (LFCA) and successfully embolized.

Case report

An octogenarian man was hit by a truck and initially admitted to another hospital. He underwent pelvis radiograph (Fig. 1) and plain whole-body CT. The result of the CT revealed slight subdural hematoma, pelvic fractures (i.e., iliac, coxa, ischium and pubis, AO classification type B2) and massive hematoma. His hemodynamics became unstable soon after CT, and the patient was transferred to our hospital (Department of Emergency Medicine, Gunma University Hospital, Maebashi, Japan). Examination on admission showed cardiopulmonary arrest (electrocardiography revealed pulseless electrical activity). The patient underwent cardiopulmonary resuscitation, including massive blood transfusion and endovascular balloon occlusion of the aorta (Rescue Balloon; Tokai Medical Products, Tokyo, Japan). Approximately 15 minutes after resuscitation, he achieved return of spontaneous circulation and was directly moved to the angio-room to undergo angiography without enhanced CT.

Initial angiography and angioembolization

Angiography and angioembolization were performed under local anesthesia. Because resuscitative endovascular balloon occlusion of the aorta was performed from the left femoral artery, angiography was initiated by puncturing the right femoral artery. Firstly, contrasting aortography was performed below the bifurcation of the kidney artery using a 4Fr pigtail catheter (Terumo Clinical Supply Co. Ltd., Gifu, Japan). Digital subtraction angiography revealed massive arterial bleeding from the right superior gluteal artery. The right internal iliac artery was selected with a 5Fr Cobra catheter (Medikit Co. Ltd., Tokyo, Japan) and a microcatheter (Carnelian® SI; Tokai Medical Products., Tokyo, Japan) was advanced to the bleeding site of the right superior gluteal artery. Angioembolization was performed using a 20% mixture of N-butyl-2-cyanoacrylate (Histoacryl; B. Braun, Melsungen, Germany) and Lipiodol (Andre Guerbet, Aulnay-sous-Bois, France). Embolization using that mixture produced an immediate occlusion of the superior gluteal artery (including the inferior gluteal artery and internal iliac artery). Subsequently, re-aortography revealed the disappearance of arterial bleeding from the right superior gluteal artery and no-arterial extravasation from other arteries. After a while, the hemodynamics became partly stable.

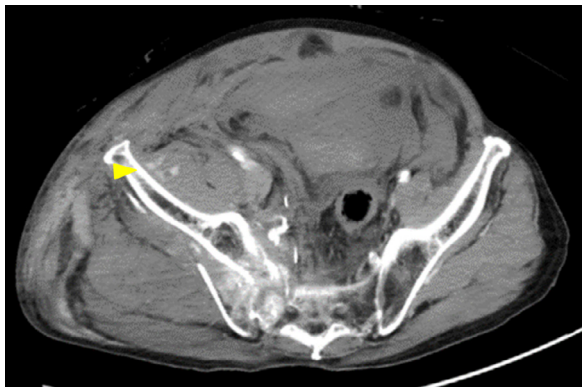

Fig. 2 – Axial image of contrast-enhanced CT after initial angioembolization. The examination revealed multiple arterial extravasations (arrowhead).

Clinical course after the initial angioembolization

After the initial angioembolization, the patient underwent contrast-enhanced CT to assess the presence of other concomitant injuries. The examination revealed minor arterial bleeding (Fig. 2), suspected to stem from the branches of the external iliac artery (Fig. 3). However, the hemodynamics of the patient continued to be stable and conservative treatment was administered. The patient underwent intensive care to monitor his physiological status. Approximately 6 hours after the initial angioembolization, the hemodynamics became unstable again. We suspected rebleeding with pelvic fracture and decided to repeat the angioembolization.

Second angiography and angioembolization

Firstly, we performed aortography using a 4Fr-pigtail catheter from the right femoral artery. Aortography revealed minor arterial extravasation from the left internal pudendal artery. The

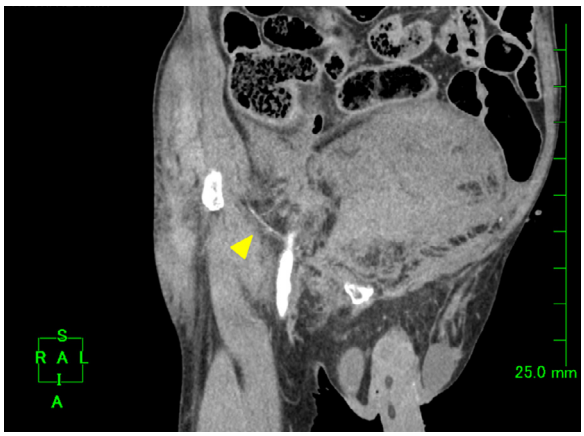

Fig. 3 – Coronal image of contrast-enhanced CT after initial angioembolization. The examination distinguished the right LFCA from the right external iliac artery (arrowhead).

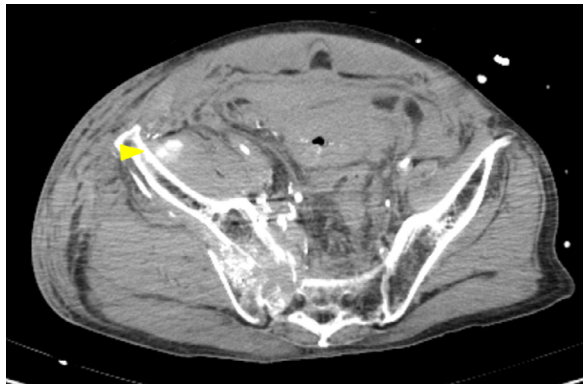

Fig. 5 – Axial image of plain CT after the second angioembolization. The examination revealed the accumulation of Lipiodol® in the area with multiple arterial extravasations, as shown by contrast-enhanced CT after the initial angioembolization.

artery was selected using a 5Fr Cobra catheter and a microcatheter (Carnelian ® SI). Angioembolization was performed using a gelatin sponge particle (Serescue; Nippon Kayaku Co. Ltd., Tokyo, Japan). After the embolization, the arterial extravasation disappeared; however, the hemodynamics remained unstable. Subsequently, we attempted to select one of the branches of the right external iliac artery because these branches were suspected to supply blood flow to the bleeding site through contrast-enhanced CT. Selective angiography of the external iliac artery did not reveal arterial extravasation and visualized the LFCA (Fig 4A). We could directly select the LFCA using a 5Fr Cobra catheter, and the contrast of LFCA revealed active arterial extravasation (Fig 4B). Therefore, we advanced a microcatheter (Carnelian® SI) to the LFCA and performed embolization using a 20% mixture of N-butyl-2-cyanoacrylate and Lipiodol®. After the embolization, the hemodynamics of the patient became stable. Plain CT revealed the accumulation of Lipiodol® in the area with multiple arterial extravasations, as shown by contrast-enhanced CT after the initial angioembolization (Fig 5). The clinical course after the second angioembolization was unremarkable and the patient was transferred to another hospital on hospital day12. The patient underwent open reduction and internal fixation on hospital day 16 and hospitalization continued at present.

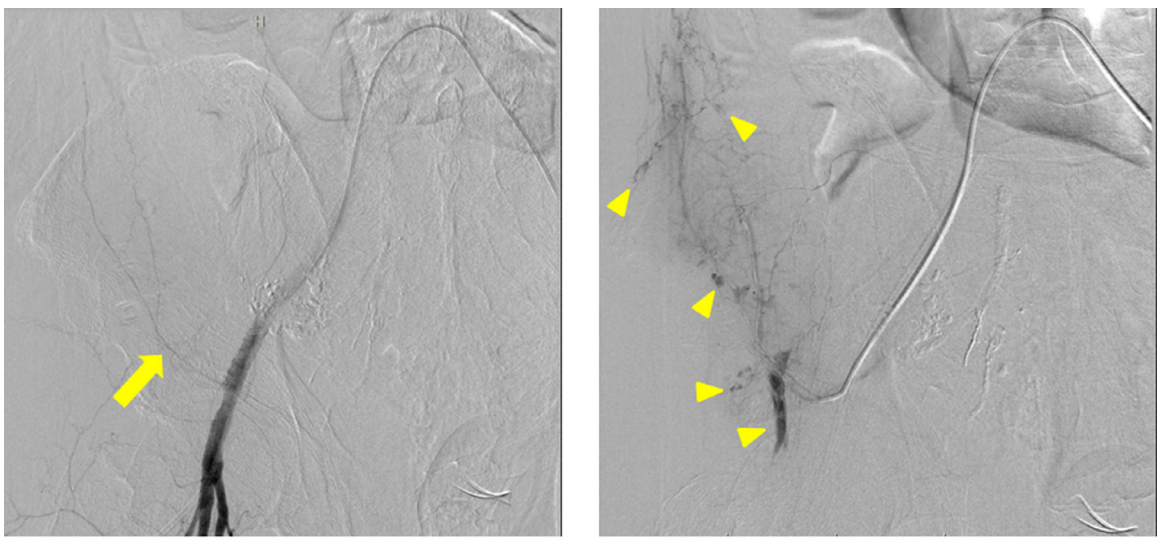

Fig. 4 – Second angiograms. (A) Angiography of the external iliac artery revealed the right LFCA (arrow) and absence of arterial extravasation. (B) Angiography of the right LFCA revealed multiple arterial extravasations (arrowheads).

Discussion

We presented a case of pelvic fracture accompanied by unstable hemodynamics. Based on aortography and selective external iliac artery angiography, this patient did not have obvious arterial extravasation. However, obvious arterial extravasation was visualized through selective hand injection of the LFCA and successfully embolized.

The branches of the internal iliac artery, such as the superior gluteal and internal pudendal arteries, are generally associated with pelvic fractures [7]. We embolized the superior gluteal artery, including the inferior gluteal artery and internal iliac artery, during the initial angioembolization. Subsequently, the hemodynamics of the patient was transiently stabilized, and became unstable once again. During the second angioembolization, we suspected that the arterial bleeding originated from the branches of the external iliac artery, based on contrast-enhanced CT (Fig. 3) [5]. However, the angiograms of the aorta and selective external iliac artery were negative. Regarding the branches of the external iliac artery, Johnson et al reported that the sensitivity of nonselective pelvic angiography for the detection of injury in a branch of the external iliac artery was only 45% [5]. Wijffles et al noted that when arterial extravasation is not confirmed at angiography, hemorrhage can be provoked through selective hand injections in the suspected artery. Actually, arterial extravasation from the LFCA could be visualized via selective hand injection and subsequently embolized. The unstable hemodynamics may be the reasons for the negative angiogram of the aorta and selective external iliac artery. Unstable hemodynamics resulted in a vasospastic condition, and arterial extravasation may have been obscured. In addition, this case received systemic vasopressor (Noradrenaline) and vasoconstriction was induced. Another possible reason is the presence of an unstable clot. This case had arterial extravasation, which was suspected to stem from the LFCA, as shown through contrast-enhanced CT. An unstable clot was formed by the time the second angioembolization was performed (approximately 4 hours from contrast-enhanced CT to second angioembolization).

Regarding pelvic fracture, the collateral circulation was reported to be developed[3], and the selection and contrast of the distal artery may be time consuming. In this case, the patient's physiology was critical, and we thought the selective contrast of artery was not practical. The selection and extent of contrast of the distal artery in hemodynamically unstable patient with pelvic fracture was comprehensively determined by factors such as patient physiology, fracture pattern,[3] and radiographical findings.

Conclusion

Selective hand contrast and embolization may be required in hemodynamically unstable patients with pelvic fracture.

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