Concomitant Blunt Splenic and Hepatic Injuries with Simultaneous Contrast Pooling Managed with Angiographic Embolization

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Non-operative management is currently the standard of care for blunt abdominal trauma patients who sustain solid organ injuries and are hemodynamically stable. Contrast pooling on imaging means active bleeding and the failure rate of non-operative management is high. Here, we describe a 65 year-old woman who sustained concomitant blunt hepatic and splenic injuries with simultaneous contrast pooling in both organs. The patient survived after angiographic embolization of vascular lesions of both solid organs. *(Chang Gung Med J 2006;29:617-21)*

Key word: blunt hepatic injury, blunt splenic injury, contrast pooling, embolization.

Non-operative management (NOM) of hemodynamically stable patients with blunt hepatic or splenic injuries has become an accepted management strategy.[1-2] Computed tomography (CT) has been widely used to evaluate patients sustaining blunt abdominal trauma when they are hemodynamically stable. Not only is CT sensitive, it can also accurately define the degree and extent of the injuries. Consequently, various CT grading systems for blunt hepatic injury (BHI) or blunt splenic injury (BSI) have been introduced to guide therapy.[3-4]

The presence of splenic contrast pooling on CT scan has been found to correlate with failure of NOM. In one study, contrast pooling, a well-circumscribed, intra-parenchymal contrast collection hyperdense with respect to the surrounding parenchyma, was seen in 67% of patients with BSI in whom NOM failed.[5] Seventy-five percent of patients with BHI who had pooling of contrast material detected on CT scans developed hemodynamic instability and later required liver-related celiotomy.[6] Splenic or hepatic contrast pooling detected on contrast-enhanced helical CT is considered a more reliable indicator for failure of NOM in patients sustaining BSI or BHI and signals the need for early interventional management.[5-6]

Here we report on a patient who sustained concomitant blunt BSI and BHI with simultaneous contrast pooling in both organs on CT scan.

CASE REPORT

A 65 year-old woman was injured when her husband fell from a tree on top of her. She was sent to a local hospital, and massive hemoperitoneum was detected on abdominal ultrasonography. After fluid resuscitation, she was transferred to our Emergency Room (ER). On arrival, she was hypotensive (84/52 mmHg). Fluid and blood resuscitation (2000 mL of 0.9% normal saline and 2 units packed red blood cells) restored her hemodynamic status (124/86 mmHg). Chest radiography showed multiple left-side rib fractures (5^{th}-9^{th}) with hemothorax. A thoracostomy with a chest tube drained 350 ml blood.

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Lumbar spinal radiography demonstrated L 3-4 compression fractures. Abdominal CT demonstrated concomitant hepatic and splenic lacerations with contrast pooling (liver: grade 2 injury at segment 6 with contrast extravasation, and spleen: grade 3 at the lower pole with intra-parenchymal contrast pooling) and a massive hemoperitoneum (Fig. 1). Subsequent celiac angiography revealed concomitant vascular lesions in the liver and spleen. Multiple pseudoaneurysms were found at the lower pole of the spleen (Fig. 2a). Simultaneously, active contrast extravasation was noted from the posterior branch of the right hepatic artery (Fig. 2b). Embolization of the splenic artery and right hepatic artery with microcoils successfully occluded the bleeders in both visceral organs (Fig. 3a & 3b).

The patient was transferred to the surgical intensive care unit (SICU) for observation. Urinary bladder pressure as an indicator of intra-abdominal pressure ranged from 13-17 cmH_2O. Her hemoglobin was stable over 3 days in the SICU. She was transferred to a ward. She received spine immobilization with a brace and rehabilitation with physical therapy to manage her lumbar spine compression fracture. She was discharged 2 weeks after admission. Her outpatient follow-up has been uneventful.

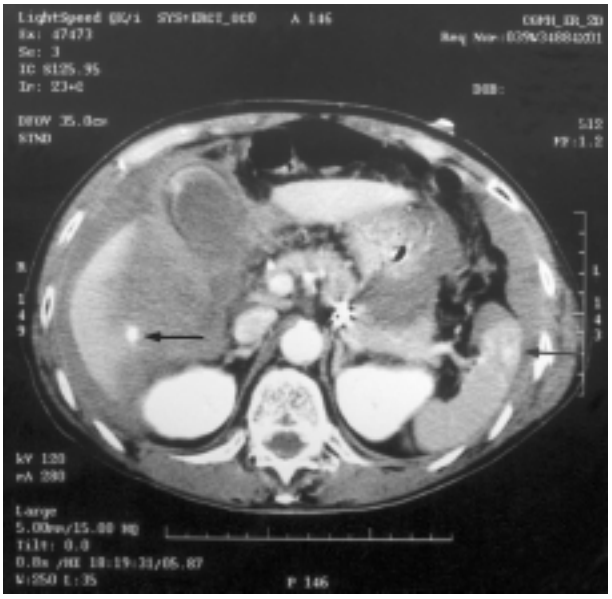

Fig. 1 Abdominal computed tomography (CT) demonstrates simultaneous hepatic contrast extravasation (arrow) at segment 6 and splenic contrast pooling (arrow) at the lower pole.

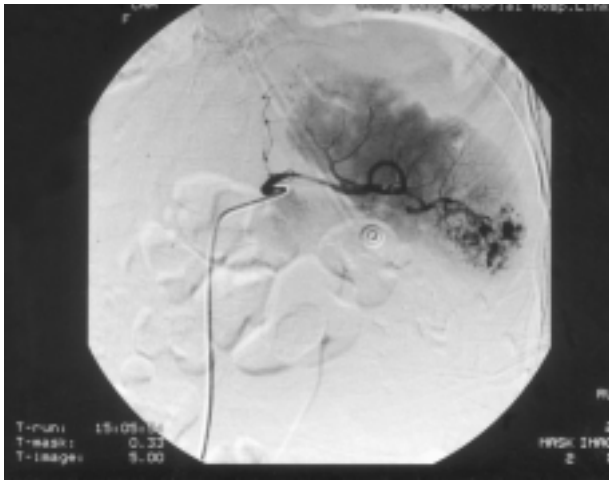

Fig. 2a Splenic arterial angiography reveals multiple pseudoaneurysms at the lower pole of the spleen.

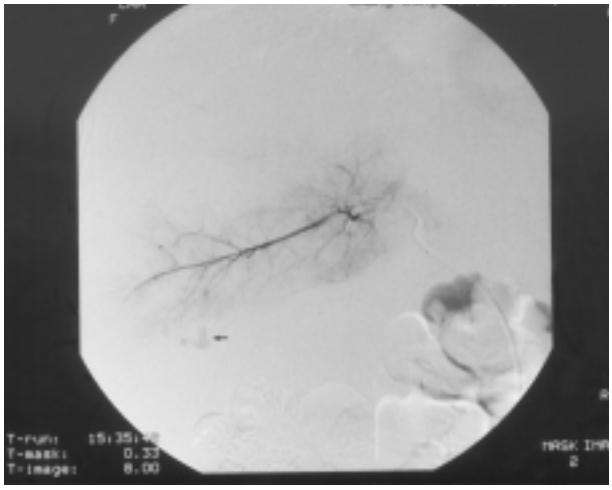

Fig. 2b Selective angiography of the posterior branch of the right hepatic artery shows active contrast extravasation (arrow) arising from this branch.

DISCUSSION

NOM has become the preferred method of dealing with hemodynamically stable patients with BSI or BHI in most trauma centers.[1-2] In a large serial multi-institutional study of BSI, 54.8% of patients were successfully managed nonoperatively; the failure rate of planned observation was 10.8%, with 61% of failures occurring in the first 24 hours.[7] For BHI, 50% to 96% of hemodynamically stable patients can be successfully treated without surgery at appropriately designated trauma centers.[2,8]

Fig. 3a Arterial embolization in the splenic arterial trunk occludes the multiple splenic pseudoaneurysms.

Fig. 3b Hepatic angiography reveals successful occlusion of the bleeder with microcoils

The increased use of high-speed helical CT scanning has resulted in better detection of active bleeding in the solid organs of patients with blunt abdominal trauma.[3,9] Pooling of contrast material on CT scan indicates active hemorrhage, and is a reliable predictor for failure of NOM.[3-5,10] Some authors reported that 67% to 82% of BSI patients with failed NOM had intraparenchymal contrast pooling on CT scans.[5,11] The presence of splenic contrast pooling on CT scan is suggested as a reliable predictor of non-operative failure. This sign increases the rate of failed NOM 24 fold.[10] However, with the use of aggressive angiographic embolization, some authors demonstrated that the failure rate of BSI with NOM decreased from 13% to 6%.[10,12]

On the other hand, contrast pooling in BSI has been successfully managed with non-surgical treatment. Success rates for patients with NOM without angiographic embolization range from 8% to 47% in various studies.[3,5,10-11] In these conditions, it is implied that intrasplenic vascular hemorrhage can be well confined and tamponaded. Spontaneous thrombosis of a traumatic intraparenchymal pseudoaneurysm has also been reported.[13]

Contrast pooling in BHI has been categorized into three types.[4] Type 1 shows extravasation and pooling of contrast medium in the peritoneal cavity. Type 2 shows the simultaneous presence of hemoperitoneum and intraparenchymal contrast medium pooling. Type 3 shows intraparenchymal contrast medium pooling without hemoperitoneum. In one study, all (6/6) patients with type 1 and 67% (4/6) of those with type 2 eventually required surgical intervention. However, none (0/3) of those with type 3 needed surgery.[4] Pooling of contrast medium on CT scan indicates active hemorrhage, and angiographic embolization is an alternative intervention for arterial bleeding in blunt hepatic injury.[9,14] In our patient, CT demonstrated type 1 contrast pooling. The image characteristics and initial hypovolemic shock justified emergency angiography to detect bleeders and subsequent selective embolization to control hemorrhage under the condition of hemodynamic stability.

Contrast pooling in BHI does not exclusively indicate arterial hemorrhage. The bleeding source could be the hepatic artery, hepatic vein, portal vein, or inferior vena cava. Bleeding from the venous systems can not be controlled by transcatheter embolization. Some authors demonstrated that 36% to 43% of patients (4/7) with hepatic contrast extravasation on CT scans had negative angiographic findings.[15-16] Under the awkward condition of possible false-negative angiographic findings, dual-phasic or tri-phasic dynamic CT scan might provide a helpful alternative to distinguish between arterial and venous hemorrhage. However, so far, there are no reports on this. A prospective study is needed to verify the value of this examination.

In the current case, hypotension with hypovolemia was noted on arrival in the ER. CT showed splenic intra-parenchymal contrast pooling and hepatic contrast extravasation. In cases of persistent

shock after resuscitaion, emergency laparotomy is manadatory for management of visceral bleeding. However, normal hemodynamic status was restored after resuscitation in this case. Angiographic embolization was first chosen as the intervention to stop bleeding. Angiography is best reserved for hemodynamically stable patients.[16] It revealed vascular lesions in the viscus and embolization stopped the ongoing hemorrhage in our patient. The complications of arterial embolization include femoral artery injury, tissue ischemia or necrosis, abscess formation, re-bleeding, and acute tubular renal failure.[14,16] There were no complications in our patient.

The important signs of hemorrhage in arterial angiography include extravasation (pooling of contrast that persists after venous washout), pseudoaneurysm (a vessel rupture contained by one or more layers of aterial wall or surrounding tissue), abrupt cutoff of a vessel, and arteriovenous fistula (early filling of a draining vein due to arterial rupture).[14] In the current case, we felt that the liver lesion should receive angiographiy embolization first because of active hemorrhage present on CT and angiographic contrast extravasation.

We could find no reports concerning concomitant BSI and BHI with contrast pooling successfully managed with angiographic embolization of both vascular lesions. Although contrast pooling in solid organs does not necessarily mean arterial bleeding, angiography may be the first choice of treatment if the patient is hemodynamically stable.

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以血管栓塞處理脾臟及肝臟同時鈍挫傷合併兩者同時顯影劑滯留

徐榆堡 方禎鋒 林炳川

對於腹部挫傷合併實體臟器裂傷及出血，只要生命跡象穩定，非手術療法是目前處理的主流思想。然而，影像攝影若顯示顯影劑滯留或外漏，常意味著非手術療法有高失敗率。此處，我們報導一例肝、脾臟同時鈍挫傷，且影像表現兩者器官同時有顯影劑滯留變化。目前文獻上尚無此類病例報告。經過血管攝影栓塞兩者器官的血管病變，病患最後平安地出院。(長庚醫誌 2006;29:617-21)

關鍵字：脾臟挫傷，肝臟挫傷，顯影劑滯留，血管栓塞。

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