ENDOVASCULAR MANAGEMENT OF TRAUMATIC LUMBAR ARTERY HEMORRHAGE FOLLOWING VERTEBRAL BURST FRACTURE IN NONAGENARIAN

Maniam, S[1*], Chan, K.W[1]

[1] University Malaya Research Imaging Centre, Biomedical Imaging, Kuala Lumpur, Malaysia.

***Corresponding author:**
Shamini Maniam, University Malaya Research Imaging Centre, Biomedical Imaging, Kuala Lumpur, Malaysia. Email: drshaminimaniam@gmail.com

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ABSTRACT:
This report describes a case of lumbar artery haemorrhage secondary to vertebral fracture in an elderly patient treated with emergent endovascular embolization. A 91-year-old woman presented after a fall with hypotension and back pain. Initial Focused Assessment with Sonography for Trauma (FAST) was negative. Contrast-enhanced computed tomography revealed multilevel vertebral fractures, active extravasation from the right L3 lumbar artery, and a large retroperitoneal hematoma. Emergency angiography confirmed active bleeding. Super-selective embolization using a Gelfoam-coil sandwich technique achieved complete haemostasis. The patient's hemodynamic status stabilized, and she recovered without further complications. This case highlights the importance of contrast-enhanced CT and the effectiveness of transcatheter arterial embolization in geriatric trauma.

Key words: Lumbar artery injury, retroperitoneal haemorrhage, geriatric trauma, vertebral fracture, transcatheter arterial embolization

INTRODUCTION

Vertebral fractures, particularly in elderly individuals following low-energy trauma such as domestic falls, are frequently encountered in emergency departments. While most vertebral fractures, including compression and burst fractures, are managed conservatively, they may occasionally be associated with vascular injuries that can lead to life-threatening consequences. Although rib fractures often dominate clinical attention in fall-related trauma, concomitant vertebral fractures may result in injury to adjacent vascular structures. Among these, lumbar artery injury is a rare but serious complication that may lead to retroperitoneal haemorrhage and hypovolemic shock if not promptly recognized and managed [1,2].

Focused Assessment with Sonography for Trauma (FAST) is a rapid bedside tool commonly used to detect hemoperitoneum, pleural and pericardial effusions, and, in experienced hands, major solid organ injuries involving the liver, spleen, or kidneys. However, its diagnostic utility is limited

for evaluating retroperitoneal structures, diaphragmatic injuries, and bony trauma [3]. In hemodynamically stable patients, contrast-enhanced computed tomography (CT) remains the imaging modality of choice because of its high diagnostic accuracy and ability to identify active arterial bleeding and associated injury patterns. When vascular injury is suspected, catheter angiography serves both diagnostic and therapeutic purposes. Super-selective transcatheter embolization allows precise localization and effective control of bleeding while minimizing the need for surgical exploration [4].

We report a case of lumbar artery haemorrhage secondary to vertebral fracture in a nonagenarian patient, highlighting the diagnostic limitations of FAST and the crucial role of contrast-enhanced CT and emergent endovascular embolization in achieving rapid haemostasis.

CASE REPORT

A 91-year-old woman presented to the emergency department following a fall at home with complaints of right-sided chest and lower back pain. On arrival, she appeared lethargic and was hypotensive, with bruising and tenderness over the right chest wall. No spinal tenderness or neurological deficit was identified. Laboratory analysis revealed lactic acidosis and a reduced haemoglobin level of 7.7 g/dL. FAST examination performed in the trauma bay did not demonstrate intra-abdominal free fluid.

Resuscitation was initiated, and bedside radiography demonstrated multiple right sided rib fractures and pleural effusion. Despite ongoing resuscitative measures, the patient's condition deteriorated with signs of hypovolemic shock. Urgent multiphase contrast-enhanced CT demonstrated multilevel vertebral compression fractures with an L2 vertebral body burst fracture associated with active arterial contrast extravasation from the right L3 lumbar artery and a large right-sided retroperitoneal hematoma (Figure 1).

The patient was transferred emergently to the angiography suite. Digital subtraction angiography (DSA) of the abdominal aorta confirmed active contrast extravasation from the right L3 lumbar artery (Figure 2). Given the rich anastomotic network of the lumbar arteries, selective DSA using a 4Fr Cobra catheter was performed on the right lumbar arteries one level above (L2) and one level below (L4) the target vessel, as well as the contralateral left L3 lumbar artery, both before and after embolization; no additional bleeding sources or collateral contribution to the haemorrhage were identified at any of these levels. Super-selective catheterization of the right L3 lumbar artery was then performed using a 2.7 French microcatheter (Progreat, Terumo, Japan) advanced coaxially through a 4Fr catheter system. Prior to embolization, selective DSA of the right L3 lumbar artery confirmed no radiculomedullary branch consistent with the artery of Adamkiewicz arising from the vessel. The Gelfoam–coil sandwich technique was executed in a stepwise manner: initially, a 2 mm × 5 cm pushable coil was deployed distally beyond the bleeding point to achieve distal mechanical occlusion; subsequently, small pledgets of gelatin sponge (Gelfoam) were instilled to fill the intervening segment and promote thrombosis; finally, two further pushable coil was deployed proximal to the bleeding point to complete the sandwich construct and prevent retrograde reconstitution. Post-embolization angiography demonstrated complete occlusion of the injured vessel with no residual contrast extravasation (Figure 2). Following the procedure, the patient's hemodynamic parameters stabilized, and serial haemoglobin monitoring demonstrated no further decline. The patient's clinical condition improved progressively, and she was discharged home after ten days of hospitalization.

This case highlights the importance of contrast-enhanced CT in identifying occult retroperitoneal bleeding in trauma patients with negative FAST findings and demonstrates the effectiveness of super-selective transcatheter embolization in achieving rapid haemostasis in elderly patients with lumbar artery injury.

DISCUSSION

The lumbar arteries typically arise in four pairs from the abdominal aorta and course laterally around the vertebral bodies from L1 to L4. At the level of the intervertebral foramen, each artery divides into dorsal and spinal branches supplying the spinal cord, paraspinal muscles, and surrounding structures [5].

Lumbar artery haemorrhage is a rare but recognized complication that may occur following trauma or various clinical interventions such as renal biopsies or spinal surgery. When associated with vertebral fractures, lumbar artery injury may result in significant retroperitoneal haemorrhage and hypovolemic shock. Because of the deep retroperitoneal location of these vessels, early diagnosis can be challenging, particularly when clinical findings are subtle.

Previous reports have described lumbar artery rupture associated with vertebral fractures. Di Meglio et al. described a case of bilateral lumbar artery rupture following vertebral injury that was successfully managed with endovascular embolization [2]. Similarly, Lee et al. reported a patient who developed hypovolemic shock secondary to lumbar artery injury associated with a transverse process fracture, with successful recovery following angiographic embolization [1]. These reports highlight the importance of considering vascular injury in patients presenting with vertebral fractures and unexplained hemodynamic instability.

Transcatheter embolization is a valuable option in the management of traumatic arterial haemorrhage, particularly when the injured vessel is either non-critical for tissue viability or poses significant challenges to surgical access. Lumbar artery injuries typically satisfy both of these criteria. Owing to their deep retroperitoneal location and proximity to vital structures, surgical exposure is technically demanding and associated with increased operative risk. Furthermore, exploration of a retroperitoneal hematoma may disrupt the intrinsic tamponade effect of surrounding tissues and worsen haemorrhage. In contrast, image-guided embolization allows precise localization and occlusion of the bleeding vessel with reduced morbidity and rapid hemodynamic stabilization [6].

The choice between selective and non-selective embolization depends on factors such as vessel anatomy, accessibility, and the urgency of haemorrhage control. Selective embolization enables targeted occlusion of the bleeding vessel while preserving adjacent vascular territories [7]. In the present case, super-selective cannulation of the right L3 lumbar artery allowed distal embolization, reducing the risk of non-target embolization and potential neurological complications.

A critical consideration during embolization of lumbar or segmental arteries is the potential presence of radiculomedullary branches supplying the spinal cord, particularly the artery of Adamkiewicz. This vessel represents the dominant arterial supply to the anterior thoracolumbar spinal cord and most commonly arises from posterior intercostal or lumbar arteries between the T8 and L1 vertebral levels, typically on the left side [8]. It subsequently joins the anterior spinal artery and demonstrates a characteristic hairpin configuration on angiographic imaging [9]. Despite its typical origin between T8 and L1, anatomical variation of the artery of Adamkiewicz necessitates careful angiographic evaluation before embolization, as inadvertent embolization may result in spinal cord ischemia and devastating neurological complications [10]. Digital subtraction angiography of the lumbar segmental arteries was therefore performed before embolization, and no radiculomedullary branch consistent with the artery of Adamkiewicz was identified arising from the L3 lumbar artery, allowing safe super-selective embolization. The choice of embolic agents depends on factors such as vessel size, accessibility, and the need for durable occlusion. Commonly used embolic materials include gelatin sponge, polyvinyl alcohol particles, and metallic coils [3]. In this case, a Gelfoam–coil sandwich technique was employed. This technique involves

a sequential, layered deployment of embolic material: first, a metallic coil is deployed distally beyond the bleeding point to achieve distal mechanical occlusion; second, Gelfoam pledgets are instilled into the intervening segment to promote thrombosis and fill the vascular space; and third, proximal coil is deployed proximally to prevent retrograde reconstitution and complete the sandwich construct. This combined approach provides durable haemostasis by occluding the vessel both proximal and distal to the injury, while the interposed Gelfoam augments thrombosis and reduces the risk of rebleeding compared with either agent alone [4].

CONCLUSION

Lumbar artery injury is a rare but potentially life-threatening complication of vertebral fractures. In trauma patients presenting with unexplained hemodynamic instability and negative FAST findings, retroperitoneal haemorrhage should be considered. Contrast-enhanced CT plays a critical role in identifying vascular injury, while endovascular embolization provides a rapid and minimally invasive method for achieving haemostasis. Careful angiographic evaluation to exclude spinal cord-supplying branches is essential to minimize the risk of neurological complications during embolization.

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FIGURE LEGENDS:

Figure 1: Contrast enhanced CT showed arterial contrast extravasation (blush) (yellow arrow) (A) and pooling of contrast in the delayed phase (yellow arrow) (B) likely from the right L3 lumbar artery coursing adjacent to the L2 vertebral body (yellow arrow head) (C) with right retroperitoneal hematoma (white arrow) (A,B,). Generalized osteopenic bones, with multilevel compression fractures and L2 burst fracture(D).

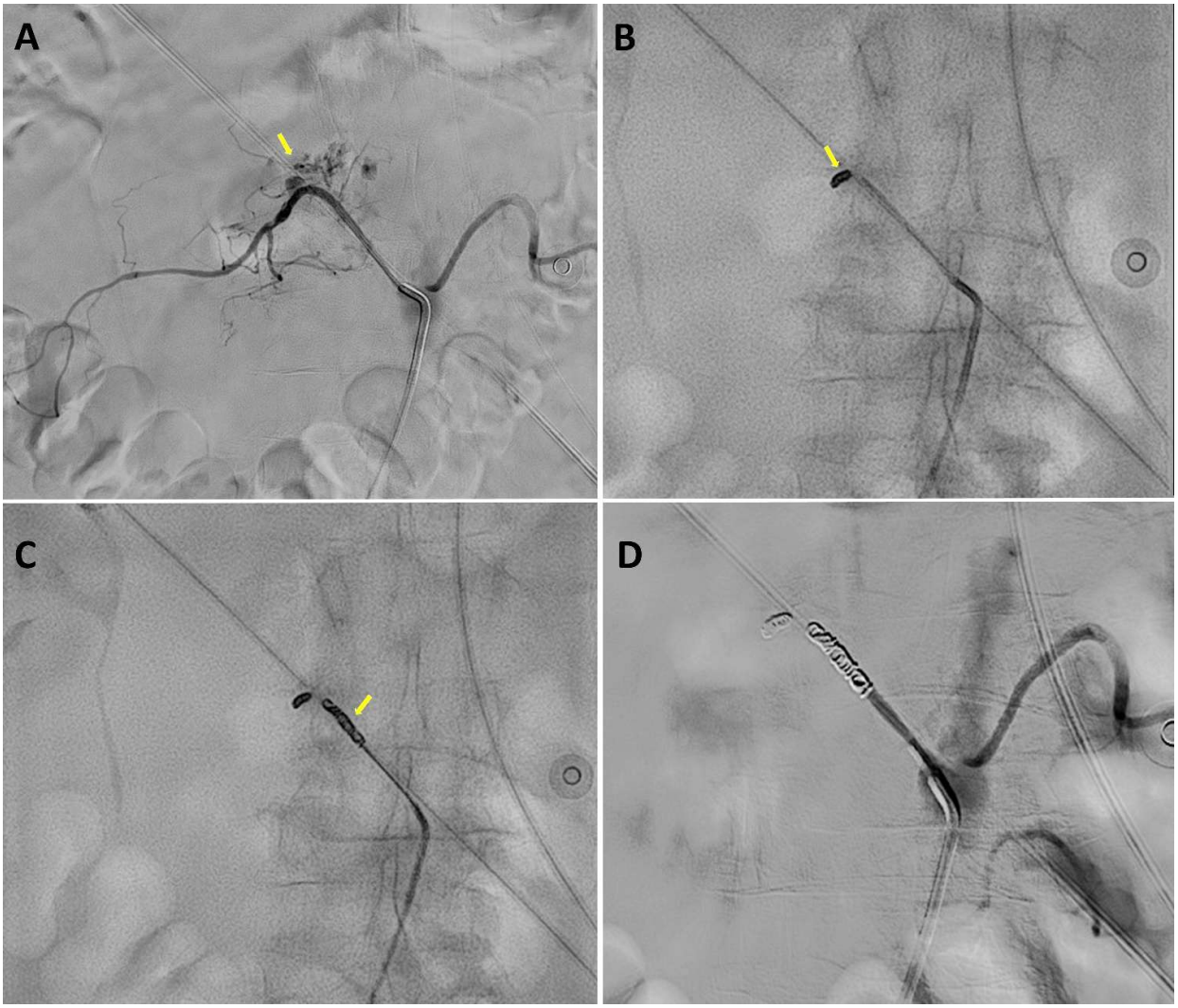

Figure 2: Digital subtraction angiography (DSA) of the right L3 lumbar artery demonstrating active contrast extravasation (yellow arrow)(A). Microcatheter positioned within the right L3 lumbar artery with placement of the proximal pushable coil(yellow arrow)(B). Deployment of two proximal pushable coils following Gelfoam instillation (yellow arrow) (C). Post-embolization DSA confirming satisfactory occlusion of the right L3 lumbar artery with no residual contrast extravasation following the completed coil–Gelfoam–coil sandwich construct (D).