

[ CASE REPORT ]

## The Endovascular Management of an Iatrogenic Superior Gluteal Artery Rupture Following Bone Marrow Biopsy

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### Abstract:

We herein report an uncommon case of a life-threatening retroperitoneal hematoma after a bone marrow biopsy. Two hours after iliac crest bone harvesting, the patient experienced syncope and severe hypotension. Urgent contrast-enhanced computed tomography demonstrated extravasation from the superior gluteal artery. Transcatheter coil embolization was performed successfully, without complications. Life-threatening complications caused by retroperitoneal bleeding after bone marrow biopsy are very rare. There are few reports on the use of endovascular treatment in the management of life-threatening hemorrhagic complications after bone marrow biopsy.

**Key words:** bone marrow biopsy, superior gluteal artery, iatrogenic complication, endovascular treatment

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### Introduction

At present, bone marrow (BM) biopsy is usually used to evaluate hematologic disorders and oncologic diseases; it is also important for predicting the prognosis and assessing the response to therapy.

The posterior iliac crest is the most suitable region for performing BM aspiration. Bleeding, infection and chronic pain are important complications that are associated, but rarely reported, in patients who undergo this examination. Retroperitoneal hemorrhage is an extremely unusual complication, with few cases reported in the literature. We herein present a case of massive hemorrhage after damage to the left superior gluteal artery (SGA) that occurred during BM biopsy procedure that was successfully managed with an endovascular approach.

### Case Report

A 42-year-old woman, with a medical history of hypertension, smoking, left hemicolectomy and myomectomy, was referred to the emergency room with an 8-week history of

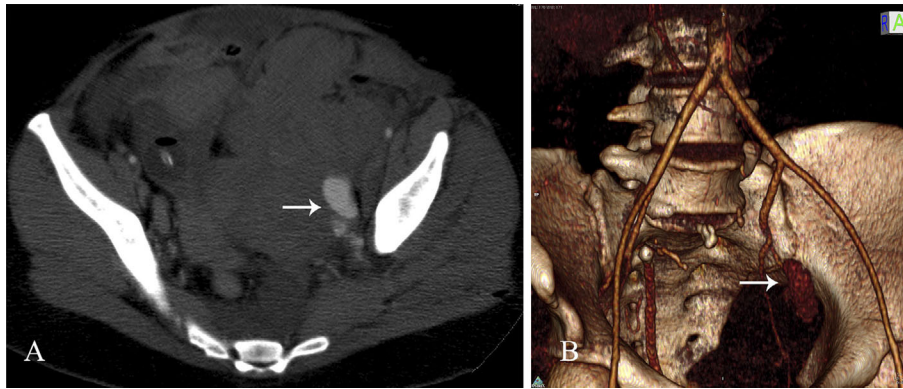
fever (37.3°C). The patient was non-responsive to antibiotic therapy and also presented with itching, asthenia and dry cough. The results of a blood analysis were as follows: hemoglobin (Hb), 12 g/dL; platelet count,  $320 \times 10^9/L$ ; aspartate aminotransferase (AST), 60 U/L, alanine aminotransferase (ALT), 55 U/L; and blood glucose, 116 mg/dL. The patient's blood pressure (BP) was 130/70 mmHg.

The patient was not being treated with anticoagulant or antiplatelet agents and her body mass index was within the normal range (23.9 kg/m<sup>2</sup>). A clinical examination revealed left laterocervical, superclavicular and axillary masses. Abdominal ultrasonography revealed diffuse lymphadenomegaly and hepato-splenomegaly. Chest X-Ray (CXR) revealed bilateral hilar lymphadenopathy. A fine needle aspiration cytology (FNAC) examination of a left laterocervical lymph node was performed and nodular sclerosis Hodgkin Lymphoma was diagnosed. The patient was therefore transferred to the oncology department where a BM biopsy of the left iliac crest was performed to confirm and stage the tumor. Two hours later, the patient presented hypotension (BP, 90/60 mmHg) and tachycardia (heart rate, 125 bpm), and complained of pain in the left iliac fossa. Urgent laboratory analyses revealed the following: Hb, 5.9 g/dL; red

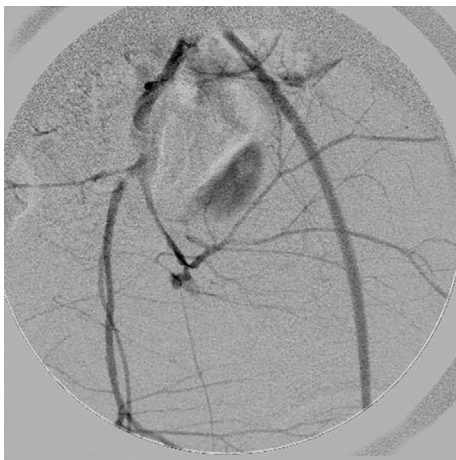
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**Figure 1.** Pre-operative contrast-enhanced CT demonstrating the rupture of the left superior gluteal artery (white arrows) and retroperitoneal hematoma (A); a volume-rendering view of the lesion (B).



**Figure 2.** A selective angiogram of the left hypogastric artery confirming the rupture of the superior gluteal artery.



**Figure 3.** The completion angiogram after coil embolization of the superior gluteal artery does not show contrast medium extravasation.



**Figure 4.** MPR CT at one week after embolization shows that the coils are well positioned and the complete resolution of the hemorrhage.

with a large (15×9 cm) retroperitoneal hematoma (Fig. 1). The patient was stabilized with mechanical ventilation, inotrope agents and blood products. She was immediately transferred to the operating room in order to perform emergency angiography. A 5 Fr vascular sheath was positioned in the right common femoral artery, an internal mammary (IM) 5 Fr diagnostic catheter was advanced through the aortoiliac bifurcation and selective catheterization of the left hypogastric artery was performed. The angiogram showed the active extravasation of contrast agent from the left SGA, confirming a vessel rupture at this level (Fig. 2).

After the super-selective catheterization of the SGA, two coils of 6 mm × 20 cm and 7 mm × 30 cm (Helix ev3 Concerto, Covidien, Plymouth, USA) were released. The completion angiogram showed complete vessel embolization without any extravasation of contrast agent (Fig. 3). The vascular sheath was removed, hemostasis was achieved with manual compression and the patient was transferred to the intensive care unit. The patient returned to the oncology department after two days in a stable condition, with a normal hemoglobin level. The surgical evacuation of the hematoma

blood cell count,  $2.13 \times 10^6/\text{mL}$ ; white blood cell count,  $9.78 \times 10^3/\text{mL}$ ; platelet count,  $150 \times 10^3/\text{mL}$ ; and prothrombin time, 12.9 seconds. Contrast-enhanced computed tomography (CT) of the abdomen showed a left SGA rupture associated

**Table. Clinical Features of Patients with Arterial Injury Following Bone Marrow Biopsy Published in the Medical Literature.**

REFERENCES	AGE/ GENDER	PRIMITIVE HAEMATOLOGIC DISEASE	BLEEDING ARTERY	COMPLICATION AFTER BM	SYMPTOMS	TREATMENT	OUTCOME
6	76/male	Acute myeloblastic leukaemia	Superior gluteal artery	Arteriovenous fistula	Pain and bruises	Selective embolization	Complete resolution
7	29/male	Thrombocytopenia and cardiac abnormalities	Superior gluteal artery	False aneurysm with massive pelvic retroperitoneal haematoma	Abdominal pain; Vomiting; Hypovolemic shock; Abdominal compartment syndrome	Selective embolization	Death
8	55/male	Thrombocytopenia	Superior gluteal artery	Pseudoaneurysm and gluteal compartment syndrome	Pain in the buttock and foot; Tingling in the foot	Selective embolization	Complete resolution
13	67/female	Leukopenia and anaemia	Hypogastric artery	Hypovolemic shock	Abdominal pain	Diagnostic arteriography	Spontaneous resolution
14	22/male	Anaemia	Median sacral artery	Retroperitoneal haematoma	Pelvic pain and hypotension	Selective embolization	Complete resolution
15	74/male	Polycythaemia vera	Iliolumbar artery	Retroperitoneal haemorrhage	Pain and vasovagal crisis	Surgical ligation	Complete resolution
9	51/male	Leukopenia	Superior gluteal artery	Pseudoaneurysm and sciatic nerve suffering	Pain in the buttock; Foot drop	Selective embolization and surgical evacuation of the haematoma	Weakness in the right lower extremity and persistent right foot drop
10	63/male	Chronic myeloid leukaemia	Superior gluteal artery	Pseudoaneurysm and superficial haematoma	Pain and swelling in the buttock	Selective embolization	Complete resolution
11	53/female	Acute myeloid leukaemia	Superior gluteal artery	Arteriovenous fistula and pseudoaneurysm	Swelling at biopsy site	Injection of thrombin	Complete resolution
12	75/male	Lung cancer with metastatic lesions	Superior gluteal artery	Pseudoaneurysm	Pain and swelling in the buttock	Injection of thrombin	Complete resolution
16	33/male	Persistent pancytopenia	Superior gluteal artery	Pseudoaneurysm	Pain and swelling in the buttock	Selective embolization	Complete resolution

was not necessary because the patient was asymptomatic. A control CT scan, which was performed at one week, showed the complete resolution of the hemorrhage and the good positioning of the coils (Fig. 4).

## Discussion

Although the BM biopsy is usually simple and safe, it can cause complications. These are mostly limited to pain at the biopsy site, local infection, nerve damage, bone fracture, needle tract seeding and bleeding. These events are reported in approximately 0.05% of procedures. The risk factors that are most commonly associated with BM biopsy-related hemorrhage include: myeloproliferative disorders, aspirin therapy, platelet dysfunction or thrombocytopenia, anticoagulant therapy, obesity and diffuse intravascular coagulopathy (1). The main arteries involved are the superior gluteal, ileolumbar, circumflex iliac, hypogastric and median sacral arteries. Retroperitoneal hematoma secondary to iatrogenic arterial injury is extremely rare, with only a few isolated cases reported in the literature.

Traditionally, patients with iatrogenic vascular bleeding have been surgically treated. Recently, however, a percutaneous endovascular approach, with both embolization and the deployment of stent-grafts, is preferred to traditional surgery due to the technological improvements, increased operator experience, minimal invasiveness and speed, the shorter hospitalization period and greater patient compliance (2-4).

Interlock detachable coils (IDC) have been shown to be safer, more effective and more rapid than standard pushable coils because they can be advanced and retracted before their final placement in the vessel. Thus, IDCs are preferred in the peripheral areas in which precise embolization therapy is required (5).

Injury of the superior gluteal, internal iliac, circumflex iliac and iliolumbar arteries have been described in various case reports. Berber et al. described the case of a 76-year-old man who presented with an arteriovenous fistula (AVF) in the left SGA, who was successfully treated by catheterization of the left internal iliac artery and selective coil embolization (6). Chamisa et al. observed a laceration of the SGA in a 29-year-old man, which caused a massive retroperitoneal hemorrhage. Transcatheter embolization was unsuccessful, and surgery was not performed due to the patient's cardiac morbidity; this resulted in the death of the patient (7). Sullivan et al. Ge et al., and Caldwell et al. reported the iatrogenic development of SGA pseudoaneurysm after BM biopsies. The clinical presentations of the cases displayed high variability, and included: hematoma with buttock pain, sciatic nerve discomfort and gluteal compartment syndrome. Endovascular embolization was selected in all cases, either alone or with the evacuation of the hematoma, with complete procedural success. Only Ge et al. reported the permanence of nerve dysfunction with foot drop in a mid-term follow-up examination (8-10).

The injection of thrombin under ultrasound guidance,

which has been associated with good outcomes, represents an alternative approach to the treatment of iatrogenic pseudoaneurysms (11, 12). Neesse et al. described a case of bleeding from the hypogastric artery after BM biopsy. Digital arteriography, consisting of the super-selective catheterization of the right internal iliac artery did not show any active bleeding; thus, intervention was not required (13). Al Zahrani et al. reported the first case of median sacral artery involvement. An emergency angiography and embolization procedure was performed using seven micro-coils (14).

Along with the numerous case reports dealing with the endovascular approach to iatrogenic vascular lesions after BM biopsies, there are reports about open surgery. Luoni et al. detected bleeding from the iliolumbar artery by digital arteriography, which was managed with laparotomy and surgical ligation (15). The different procedures and outcomes in the literature are reported and compared in Table.

The literature reported to date presents a relatively large number of reports dealing with vascular iatrogenic lesions following BM biopsies, that are usually limited to a localized hematoma, AVF or pseudoaneurysm. Our case involved a wider hemorrhage that extended to the retroperitoneum. Similarly to the authors in most of the previous reports, we chose an endovascular approach because it has proven to be a fast, safe and reliable treatment for ruptures of the SGA after BM biopsy.

Retroperitoneal hemorrhage due to arterial injury after BM biopsy is an extremely rare complication. Contrast enhanced CT is the best diagnostic modality for detecting it; however, angiography is recommended to identify the bleeding site. Endovascular management with selective embolization is recognized as a valid, minimally-invasive, safe and feasible method for treating these adverse events.

**The authors state that they have no Conflict of Interest (COI).**

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