CASE REPORT

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

Claudia De Gregorio 1, Flavia Spalla 1, Andrea Padricelli 1, Donatella Narese 2, Umberto Bracale 3, Doriana Ferrara 1, Luca del Guercio 1 and Umberto Marcello Bracale 1

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

(Intern Med Advance Publication)
(DOI: 10.2169/internalmedicine.8195-16)

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, 320×10^9/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^2). 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

1Department of Vascular and Endovascular Surgery, University Federico II of Naples, Italy, 2Department of Radiology, DIBIMED, University of Palermo, Italy and 3Department of General Surgery, University Federico II of Naples, Italy
Received: August 31, 2016; Accepted: November 29, 2016; Advance Publication by J-STAGE: September 6, 2017
Correspondence to Dr. Umberto Marcello Bracale, umbertomarcello.bracale@unina.it
blood cell count, 2.13×10⁶/mL; white blood cell count, 9.78×10⁹/mL; platelet count, 150×10⁹/mL; and prothrombin time, 12.9 seconds. Contrast-enhanced computed tomography (CT) of the abdomen showed a left SGA rupture associated 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

---

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

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

**References**