Received: 2013.04.10
Accepted: 2013.07.09
Published: 2013.11.20

ISSN 1507-6164
© Am J Case Rep, 2013; 14: 489-493
DOI: 10.12659/AJCR.889274

Retroperitoneal hemorrhage associated with bone marrow trephine biopsy

Authors' Contribution:
Study Design A
Data Collection B
Statistical Analysis C
Data Interpretation D
Manuscript Preparation E
Literature Search F
Funds Collection G

BDEF 1 **Wan Fariza Wan Jamaludin**
DE 2 **Shahizon Azura Mohamed Mukari**
BDEF 1 **S. Fadilah Abdul Wahid**

1 Cell Therapy Centre and Department of Medicine, Universiti Kebangsaan Malaysia Medical Centre (UKMMC), Jalan Yaacob Latif, Kuala Lumpur, Malaysia
2 Department of Radiology, Universiti Kebangsaan Malaysia Medical Centre (UKMMC), Jalan Yaacob Latif, Kuala Lumpur, Malaysia

Corresponding Author: S. Fadilah Abdul Wahid, e-mail: sfadilah@ppukm.ukm.edu.my

Patient: Male, 19
Final Diagnosis: Hyperleukocytosis • thrombocytosis
Symptoms: Hyperleukocytosis • retroperitoneal hemorrhage • thrombocytosis
Medication: —
Clinical Procedure: Bone marrow trephine biopsy
Specialty: Hematology • Radiology

Objective: Diagnostic/therapeutic accidents
Background: Bone marrow (BM) trephine biopsy is generally a safe procedure, but adverse events such as retroperitoneal hemorrhage (RPH) may occur. We report 3 cases of this complication.
Case Report: A 19-year-old male with thrombocytopenia and coagulopathy underwent BM trephine biopsy to confirm relapse of acute lymphoblastic leukemia. Two hours later, he developed severe hypotension and a CT scan revealed a massive RPH, and was treated conservatively. The RPH recurred 2 weeks after chemotherapy and was successfully treated with gel foam embolization. A 55-year-old male with coagulopathy underwent BM trephine biopsy for hyperleukocytosis and thrombocytosis. He developed a large RPH preceded by left lumbar dermatome sensory neuropathy. He was treated conservatively. A 56-year-old overweight woman on aspirin underwent BM trephine biopsy for polycythemia. Twelve hours later she developed severe abdominal pain with hypotension. A CT scan showed a massive RPH and secondary hemothorax. She was treated conservatively and the RPH resolved after several months.
Conclusions: We and others showed that myeloproliferative neoplasm, quantitative or qualitative platelet abnormalities, aspirin, coagulopathy, and obesity are associated with development of RPH following BM trephine biopsy. Early diagnosis and intervention are crucial. Correction of coagulopathy and cessation of anti-platelet treatment prior to biopsy can prevent this serious complication.

Key words: bone marrow trephine biopsy • retroperitoneal hemorrhage • Retroperitoneal hematoma

Full-text PDF: <http://www.amjcaserep.com/download/index/idArt/889274>

1091 1 1 12

Background

BM biopsy is a routine yet vital diagnostic tool used widely in hematological conditions. It provides important information on response to treatment, prognosis, and hematopoietic involvement in systemic diseases. Generally it is considered a safe procedure, with a low risk of morbidity. Common complications include mild pain at the biopsy site and occasional oozing, and rarely serious events may occur, such as infections, needle tract seeding, pressure neuropathy, retroperitoneum, iliac bone fracture, needle break, fluid leak, and RPH [1]. Fatalities due to RPH following BM biopsy are well described in the literature [2–5].

Case Report

Patient 1

A 19-year-old Malay male who weighed 50 kilograms, with a previous history of acute lymphoblastic leukemia presented to hematology ward with neutropenic sepsis. The hemoglobin was 9.5 g/dL, total white cells were $1.2 \times 10^9/L$, and platelets were $24 \times 10^9/L$. The coagulation profile was later revealed to be abnormal, with PT 13.9s (ratio 1.12) and APTT 180s (ratio >4.5). A BM trephine biopsy was performed to confirm disease relapse. Two hours later, the patient became hypotensive (50/30 mmHg). A CT scan of the abdomen showed a large (20×4×4 cm) retroperitoneal hematoma (Figure 1A). At that time, no contrast extravasation was reported. He was stabilized with mechanical ventilation, inotrope agents, and blood products. A modified BMF-90 protocol without the intrathecal component was administered 2 weeks later. Five days into chemotherapy, he complained of severe left iliac fossa pain radiating to the groin and associated with hypotension (80/50 mmHg). The hemoglobin dropped to 4.2 g/dL and platelets were $11 \times 10^9/L$. A repeat CT scan of the abdomen revealed a massive (19×8×9 cm) hematoma anterior to the left internal iliac vessels, with contrast extravasation from a branch of the left internal iliac artery (Figure 1B, 1C). An attempt at angiographic coiling was unsuccessful, and the hemorrhage was terminated using gel foam embolization. A repeat angiogram 24 hours later revealed no further active bleeding and the patient recovered well.

Patient 2

A 55-year-old Chinese male who weighed 78 kilograms was referred for investigation of hyperleukocytosis and thrombocytosis. The total white cell count was $355 \times 10^9/L$, hemoglobin was 9.3 g/dL, and platelets were $577 \times 10^9/L$. The PT was 18.6s (ratio 1.67) and APTT was 48s (ratio 1.26). A BM trephine biopsy with repeated attempts was performed on the

Figure 1. CT angiography of abdominal aorta in axial section for Patient 1. (A) Twenty-four hours after bone marrow trephine biopsy from the left PSIS, demonstrating a 20×4×4 cm hypo-isodense mass (white arrow) consistent with a retroperitoneal hematoma. (B) Two weeks after the initial scan, demonstrating a pool of extraluminal contrast (straight arrow) medial to a branch of left internal iliac artery (curved arrow) and; (C) a 19×8×9 cm retroperitoneal hematoma which has increased in size.

Table 1. Clinical characteristics, risk factors and outcome in patients with RPH after BM biopsy.

Author [reference number]	Number of cases	Underlying disease(s)	Obesity	Thrombocytopenia (count $\times 10^9/L$ in parantheses)	Possible platelet dysfunction (aspirin therapy in parantheses)	Coagulopathy (anticoagulation or DIC)	Outcome
A Wahid 2007 [10]	1	PRV	Yes		Yes		Alive: 1
Bain 2003 [2]	14	ET: 5 PRV: 2 CML: 1 BC: 1 MD: 2 Carcinoma: 1 Anemia of chronic disease: 1 Unknown: 1	Yes Yes in 1	Yes (25 and 68) Yes (50)	Yes (3 on aspirin) Yes Yes Yes Yes	Yes (DIC) Yes (DIC) Yes (anticoagulation)	Fatal: 1
Bain 2004 [6]	10	ET: 2 MPD: 2 MDS: 1 MF: 1 WM: 1 Following BMT for refractory AML: 1 Anemia of chronic disease: 1 Megaloblastic anemia: 1	Yes in 1	Yes in 1 (96) Yes (23) Yes (38) Yes (17)	Yes (1 on aspirin) Yes (1 on aspirin) Yes Yes Yes	Yes (1 on anticoagulation) Yes (anticoagulation)	Fatal: 3
Bain 2005 [5]	1	MPD: 5 MDS: 1 AML: 2 ITP: 1 vWD: 1 Not stated: 1	Yes in 1 Yes in 1	Yes (39 and 86) Yes (6)	Yes (3 on aspirin) Yes Yes Yes Yes	Yes (1 on anticoagulation)	Alive: 11
Bain 2006 [7]	9	MPD: 3 AML: 1 MDS: 1 Multiple Myeloma: 1 Not stated: 3			Yes (1 on aspirin) Yes Yes Yes		Alive: 9
Chamisa 2007 [11]	1	Thrombocytopaenia		Yes (62)	Yes		Fatal: 1
Feeney 2006 [4]	1	Abdominal aortic aneurysm, chronic renal failure			Yes (aspirin)		Alive: 1
Gupta 1992 [12]	1	Multiple myeloma		Yes (49)	Yes		Fatal: 1
Luoni 1994 [1]	1	PRV			Yes		Alive: 1
Rodrigo 2004 [9]	6	PRV: 2 CML: 1 Lymphoma & osteoporosis: 1 Renal osteodystrophy & osteoporosis: 1 Paget's disease: 1	Yes		Yes Yes Yes Yes (aspirin)		Alive: 6
Salem 2003 [3]	2	ITP Pancytopenia & SLE		Yes(45) Yes (22)	Yes Yes		Alive: 2

Adapted with adjustments from Reference [2]. SLE – systemic lupus erythematosus; PRV – polycythemia rubra vera; ET – essential thrombocythemia; BC – blast crisis; MDS – myelodysplastic syndrome; MF – myelofibrosis; BMT – bone marrow transplant; MPD – myeloproliferative disease; AML – acute myeloid leukemia; ITP – immune thrombocytopenia; vWD – von Willebrand's Disease; WM – Waldenstrom's Macroglobulinemia.

left posterior superior iliac spine (PSIS). Three hours later, the patient complained of pain and oozing at the biopsy site and numbness in the left lumbar dermatome. Power was graded 4/5 at the hip and knee joints. A CT scan revealed an extensive retroperitoneal, pelvic, left gluteus maximum, and intramuscular hematoma without contrast extravasation. He was treated conservatively and recovered well. The bone marrow findings were consistent with chronic myeloid leukemia in chronic phase.

Patient 3

A 56-year-old, overweight and postmenopausal Malay female was referred for polycythemia (hemoglobin 22.6 g/dL, hematocrit 68.6%) and transient ischemic attacks. She had been taking 75 mg of aspirin daily. There was no associated coagulopathy. BM trephine biopsy with repeated attempts was taken from the right PSIS. Twelve hours later, she developed severe right-sided abdominal pain with hypotension (90/50 mmHg). A CT scan showed a massive (12×14×10 cm) hematoma at the right iliac fossa, with concomitant displacement of the inferior vena cava and iliac vessels, and compression of the right ureter, with subsequent hydronephrosis, and complicated by secondary hemothorax. She was treated conservatively and the RPH resolved after several months.

Discussion

BM biopsy is a routine yet vital diagnostic tool used widely in hematological conditions. It provides important information on response to treatment, prognosis, and hematopoietic involvement in systemic diseases. It is generally considered a safe procedure, with a low risk of morbidity. Common complications include mild pain at the biopsy site and occasional oozing, and serious adverse events may rarely occur, such as infections, needle tract seeding, pressure neuropathy, retroperitoneum, iliac bone fracture, needle break, fluid leak, and RPH [1]. Fatalities due to RPH following BM biopsy are well described in the literature [2–5].

The risks of RPH in our patients were myeloproliferative neoplasm (MPN), quantitative or qualitative platelet abnormalities, anti-platelet therapy, coagulopathy, and obesity. Putative platelet dysfunction in MPN, myelodysplastic syndrome, or disturbance of platelet function by fibrin degradation product, also contribute to the risk of bleeding [2]. In thrombocytopenia, the risk of significant hemorrhage is approximately 1:500 [6]. The procedure itself can cause direct penetration of the biopsy needle through the iliac crest, or malposition with the needle tip slipping over the iliac crest, both of which cause trauma to the retroperitoneal vessels [7]. Operator expertise may also be a contributory factor, although a previous survey did

not find a clear relationship between inexperience of the operator and the occurrence of hemorrhage [8].

In the UK, a fatality from RPH following a BM biopsy led to a national audit that identified a diagnosis of MPN as a risk factor for hemorrhage, together with aspirin, warfarin, obesity, disseminated intravascular coagulopathy, probable platelet dysfunction, and thrombocytopenia [6]. A follow-up survey revealed the rate of adverse events from BM biopsy was 0.12%; hemorrhage was the most frequent and serious event, with 3 fatal cases reported [3]. Subsequently, in 2004, hemorrhage was again revealed to be both the most common and most serious event, occurring in 9 out of a total of 15 adverse events [9]. The survey confirmed that a diagnosis of MPN is a risk factor for hemorrhage, even in the absence of aspirin therapy.

We and others have showed that myeloproliferative neoplasm (MPN), quantitative or qualitative platelet abnormalities, aspirin therapy, coagulopathy, and obesity are associated with development of RPH following BM trephine biopsy (Table 1).

Surgery has been shown to successfully evacuate hematoma causing severe respiratory distress [10]; however, the advent of interventional radiology may be beneficial in avoiding risks associated with surgery. Selective arterial embolization was shown to be an effective endovascular approach in providing a fast and minimally invasive treatment [11,12].

Conclusions

BM biopsy may occasionally cause life-threatening RPH, which may not be immediately apparent; therefore, it must be done carefully following standard guidelines, with longer periods of observation for persistent pain, and stopping all anti-platelets or anticoagulant therapy prior to the procedure. BM biopsy should only be performed when there is a clear clinical indication, and by appropriately trained personnel.

Consent

All patients or their next of kin gave their informed consent for these case reports to be published.

Competing interests

The authors declare that they have no competing interests.

Acknowledgements

We thank the support of all members of the Cell Therapy Centre, Department of Medicine and the Department of Radiology, Universiti Kebangsaan, Malaysia.

References:

1. Luoni M, Croci E, De Paoli A et al: Retroperitoneal hemorrhage following bone marrow biopsy. *Haematologica*, 1994; 79: 70–72
2. Bain BJ: Bone marrow biopsy morbidity and mortality. *British Journal of Haematology*, 2003; 121: 949–51
3. Bain BJ: Bone marrow biopsy morbidity and mortality: 2002 data. *Clin Lab Haem*, 2004, 26: 315–18
4. Chamisa I: Fatal vascular retroperitoneal injury following bone marrow biopsy. *SAMJ Forum*, 2007; 97(4): 246
5. Gupta S, Meyers ML, Trambert J, Billet HH: Massive intra-abdominal bleeding complicating bone marrow aspiration and biopsy in multiple myeloma. *Postgrad Med J*, 1992; 68: 770
6. Salem P, Wolverson MK, Reimers HJ, Kudva GC: Complications of bone marrow biopsy. *Br J Haematol*, 2003; 121: 821
7. Feeney JN, Barry JE: Massive retroperitoneal hemorrhage post bone marrow biopsy mimicking ruptured abdominal aortic aneurysm. *Eur J Radiol*, 2006, Extra 59: 77–80
8. Bain BJ: Bone marrow biopsy morbidity: review of 2003. *J Clin Pathol*, 2005; 58: 406–8
9. Bain BJ: Morbidity associated with bone marrow aspiration and trephine biopsy – a review of UK data for 2004. *Haematologica*, 2006; 91: 1293–94
10. Ishihara S, Yasuhara H, Ogawa S, Muto T: Successful surgical treatment for spontaneous retroperitoneal hematoma in polycythemia vera: report of a case. *Surg Today*, 2000; 30: 199–201
11. Arellano-Rodrigo E, Real MI, Muntanola A et al: Successful treatment by selective arterial embolization of severe retroperitoneal hemorrhage secondary to bone marrow biopsy in post-polycythemic myelofibrosis. *Ann Hematol*, 2004; 83: 67–70
12. Abdul Wahid SF, Md-Anshar F, Mohamed Mukari SA, Rahmat R: Massive retroperitoneal hematoma with secondary hemothorax complicating bone marrow trephine biopsy in polycythemia vera. *Am J Hematol*, 2007; 82(10): 943–44