CASE STUDY

52-YEAR-OLD WOMAN WITH COLON CANCER
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BACKGROUND

BD, a 52-year-old Caucasian female, presented to her primary care provider with complaints of weakness and fatigue, although she continued to work. She attributed these changes to menopause; her menstrual periods have been irregular but occasionally heavy. She experienced recent weight loss of 10 lbs over the past 6 months not attributable to diet or exercise.

LABORATORY FINDINGS

Initial laboratory workup shows: white blood cell count, 5200 cells/mm³; hemoglobin (Hgb), 7.5 g/dL; hematocrit, 26%; red blood cell (RBC) count, 3.5 x 10⁶/µL; platelet count, 650 000/µL; mean corpuscular Hgb, 24.8 µg/cell; mean corpuscular Hgb concentration, 33.4 g/dL; mean corpuscular volume (MCV), 55 µm³; and reticulocyte count, 1.5%. Serum chemistries were: creatinine, 1.1 mg/dL; bilirubin (total), 0.9 µmol/dL; blood urea nitrogen, 15 mg/dL; glucose, 124 mg/dL; sodium, 134 mEq/L; potassium, 4 mEq/L; magnesium, 1.8 mEq/L; and calcium (total), 9.2 mg/dL.

MEDICAL HISTORY

The patient reported chronic constipation and hemorrhoids, mild dyspnea on exertion, and chronic arthritis in her knees and hands. She has been monitored for hypertension with current control using diuretics. Her last mammogram 8 months ago was normal; the patient has had no screening colonoscopy or sigmoidoscopy. Current medications include furosemide 100 mg orally and ibuprofen 400 mg orally as needed. She took oral contraceptives for 10 years, but is currently not receiving hormonal therapy.

FAMILY HISTORY

Her mother, aged 83 years, has type 2 diabetes (treated for 35 years) and her father died at age 60 of acute myocardial infarction. One brother is alive at age 61 with hypertension.

SOCIAL HISTORY

BD owns and manages an interior design firm. She is divorced with 2 grown children and lives alone. She has never smoked and rarely drinks alcohol. She is an avid tennis player.

PHYSICAL EXAMINATION

BD appeared as a pale, thin woman in no acute distress. She was 5'6" tall and weighed 128 lbs. Vital signs were as follows: blood pressure, 132/86 mm Hg; pulse, 86 beats/minute; respiratory rate, 22 breaths/minute; and temperature, 37°C. Karnofsky performance status was 90%. Sclerae were anicteric with pale conjunctiva. There was no palpable adenopathy, and the lungs were clear to auscultation bilaterally. Cardiac examination was normal. The abdomen was soft without distension or tenderness, and bowel sounds were normal and present in all quadrants. There was no hepatosplenomegaly and rectal examination revealed no masses or hemorrhoids.

WORKUP

Based on the initial laboratory findings, an iron panel was drawn; serum ferritin was 8 ng/mL. The patient's history, physical examination, and laboratory data supported a diagnosis of iron deficiency anemia. Oral iron therapy 325 mg 3 times/day was initiated and the patient was advised to take the iron with vitamin C at mealtimes. She also was evaluated for an underlying cause for her anemia. Her history of menstrual blood loss was not impressive, and she denied menopause. The oral iron exacerbated her constipation, thus she was unable to obtain stool samples for fecal occult blood testing. She was changed to intramuscular iron dextran, given as 1 mL (50 mg) into each buttock each week (via Z-track technique) and given stool softeners. Stool obtained was tested for occult blood and was reported as 1+ guaiac reaction. The patient was referred to the Gastroenterology Department for colonoscopy, which found a mass approximately 6 cm in size located in the ascending colon and 18 in (45.72 cm) from the anal verge, which was biopsied. An additional adenomatous mass was removed from the transverse colon. Pathology report indicated: 1) proximal ascending colon, mass, biopsy: poorly differentiated invasive adenocarcinoma with ulceration; and 2) transverse colon, biopsy: tubular adenoma.

An abdominal computed tomography (CT) scan revealed an “apple core” lesion in the same area of her colon as on colonoscopy. No lesions were seen in her liver. Some adenopathy was appreciated proximal to the lesion in ascending colon. Chest CT scan was negative. Carcinoembryonic antigen (CEA) drawn was 6 ng/mL. The surgeon was reluctant to perform surgery with her hematocrit at 28%. Her lack of response to iron therapy was thought to be a result of an inflammatory state causing suppression of erythropoietin. Thus, her anemia was unlikely to resolve with iron replacement therapy until the underlying cause of the anemia was corrected. He ordered transfusion of 2 U of packed RBCs and scheduled an exploratory laparotomy and right hemicolectomy when her hematocrit reached 32%.

A right hemicolectomy was performed to remove the tumor. Although the CT scan showed no lesions in the liver, the surgeon biopsied a suspicious site. Pathology report indicated: 1) right colon: moderately differentiated adenocarcinoma (6 x 3.5 cm mass), carcinoma invades through the muscularis propria into pericolic fat, and all margins negative; 2) 4 of 21 pericolic lymph nodes positive for metastatic carcinoma; and 3) liver, biopsy: negative for carcinoma.
**TREATMENT PLAN**

The patient was staged as T3N2M0, or stage IIIC colon cancer. Postoperative CEA was 0.2 ng/dL. Referral was made to a medical oncologist and the FOLFOX4 regimen1 was initiated as adjuvant therapy for 6 months, consisting of oxaliplatin 85 mg/m² intravenously (IV) day 1; leucovorin 200 mg/m² IV days 1 and 2; and 5-fluorouracil 400 mg/m² IV bolus, then 600 mg/m² IV over 22 hours continuous infusion days 1 and 2. The regimen was repeated every 2 weeks once BD was cleared by her surgeon. Based on her current Hgb (9.8 g/dL) her treatment plan included darbepoetin 200 µg fixed dose as subcutaneous injection given every 2 weeks to coincide with her chemotherapy regimen.2 Erythropoietic therapy was initiated before cycle 1 of chemotherapy. The oncology nurse practitioner also instructed BD regarding exercise, nutrition, and other interventions to assist with her recovery and to address her continuing fatigue.

**TREATMENT COURSE**

BD was treated in the outpatient setting. Her continuing weakness and fatigue caused her daughter to take leave from her job to stay with her mother during chemotherapy. At the start of chemotherapy, BD’s Hgb rose to 10.6 g/dL and darbepoetin was continued throughout her course of treatment to maintain target Hgb between 11 and 12 g/dL.3 BD tolerated her therapy without serious adverse events until cycle 4 when her absolute neutrophil count dropped to 480 neutrophils/µL, requiring a delay in the start of cycle 5. Consequently, pegfilgrastim 6 mg administered subcutaneously was initiated on day 2 of cycle 5 to prevent subsequent severe neutropenia for the remainder of her chemotherapy regimen.4 The rest of BD’s treatment was completed without significant toxicities.

**DISCUSSION**

Iron deficiency is a common condition with the majority of cases in the United States occurring in women secondary to menstrual blood loss.5 If menses are not the cause, then efforts must be directed at determining the underlying etiology, and the healthcare provider needs to rule out gastrointestinal bleeding as the source of the iron loss. A symptomatic patient may require consideration of erythropoietic therapy, in addition to iron replacement.6 Generally, iron deficiency, a form of microcytic anemia, is marked by a serum ferritin level of less than 12 ng/mL and decreased MCV. Unfortunately, BD’s constipation, exacerbated by the use of oral iron, caused a delay in obtaining stool for occult blood and referral for definitive diagnosis with colonoscopy. However, once the underlying reason for the presenting anemia—a stage IIIC colon cancer—was identified and surgically removed, the patient remained anemic and at risk for more severe anemia with the initiation of adjuvant chemotherapy with its potential for hematologic toxicity. The use of darbepoetin alfa every 2 weeks was efficacious and convenient for the patient in view of her every-2-week chemotherapy regimen. Another option would have been to administer epoetin alfa 40 000 U weekly subcutaneously.7 Newer erythropoietic regimens include epoetin alfa with 60 000 U subcutaneously as a loading dose followed by 120 000 U every 3 weeks as maintenance,8 which is currently under investigation, and an every-3-week dosing schedule for darbepoetin alfa,9 which the US Food and Drug Administration recently approved. The recommended starting dose for darbepoetin alfa administered once every 3 weeks is 500 µg as a subcutaneous injection with the dose adjusted to maintain a target Hgb not to exceed 12 g/dL.10 Oncology practitioners should be mindful that developing one hematologic toxicity does not preclude occurrence of another, which happened in this case when BD experienced grade 4 (life-threatening) neutropenia and required ongoing neutrophil support with a myeloid growth factor as well as erythropoietin support.

**REFERENCES**


