

#### Case 4

Pt is an 55 year old male who presents because of intense right arm pain and inability to use the extremity. He remembers his arm being tender for the last month, but the intense pain started yesterday when he lifted a box that weighed approximately 20 lbs. He rates the pain as a 9/10, and points to a specific area on his right arm. The pain does not radiate anywhere else. Hydrocodone with acetaminophen (Vicodin) relieved the pain some, as does not using the extremity. The patient denies trauma to the area, rash, any other joint, muscular, or bone pain.

#### **What things could be causing his problem?**

Point extremity tenderness is often a result of ligamentous, muscle, or bone injury. With the intensity of his symptoms, a fracture is at the top of the differential. Does it seem odd that he would fracture a bone lifting a light box?

#### **What other review of systems would you like to know?**

Any fever, change in energy, weight, dizziness, headaches, cough, change in urine volume, abdominal pain, nausea/vomiting, GERD (gastroesophageal reflux disease) symptoms, constipation, BRBPR (bright red blood per rectum), melena, episodes of seizures or syncope, any signs of depression (SIG E CAPS- sleep, interests, guilt, energy, concentration/memory, affect/appetite, psychomotor changes, suicidal/sexuality/somatic symptoms)

The patient admits to being noticeably more lethargic for approximately one month despite plenty of sleep. He has also had a decrease in his urine the last few days. He denies any other problems.

#### **What other history would you like to know?**

Past medical history, Past surgical history, Family History, Smoker, Drinker, Work type, Marital status, Medications, Allergies.

Past medical history and past surgical history: controlled hypertension, patient visits doctor annually and just had a colonoscopy which was negative for evidence of malignancy

Family History: both parents are still alive and completely healthy

Social History: married, non-smoker and non-drinker, works in a factory

Medication: metoprolol (beta blocker) and hydrochlorothiazide (HCTZ, diuretic)

Allergies: none

#### **What physical exam finding would you look for?**

First, you want to know the vital signs. Is the patient febrile, tachycardic, tachypneic, hyper or hypotensive, hypoxic? The patient's overall color (looking for pale or jaundice), any rubs, gallops, or muffled heart sounds? Does the patient have rales, crackles,

wheezes, or decreased breath sounds? Is the belly tender? Hypo or hyperactive bowel sounds? Is the arm bruised, swollen, or any other deformity noted? Is it tender to touch? Is there any rash over the area? Is the patient's active and passive range of motion decreased?

The patient is an African American male with normal body habitus whose blood pressure is 158/79 with a heart rate of 62. His palms are pale looking. His arm appears completely normal, but the patient winces when you palpate the area. Passive motion is intact, but painful. Active motion is severely limited.

**What labs/imaging studies would you like to order in a patient with pathological fracture, lethargy, and decrease urine output?**

CBC (complete blood count) with smear- looking for anemia, leukocytosis. smear will show any RBC abnormalities (schistocytes, rouleaux formation, etc)

CMP (complete metabolic profile)- looking for hypercalcemia, change in electrolytes, BUN and creatinine, and total protein and albumin

SPEP (serum protein electrophoresis)- screen for multiple myeloma

UPEP (urine protein electrophoresis)- screen for multiple myeloma

Serum viscosity- looking for serum sludging

EKG (Electrocardiogram)- electrolyte abnormalities from renal failure can effect heart conduction

Arm X-Ray- looking for fracture/lytic lesion

Skeletal series- ordered when working up pathological fractures

PTH (parathyroid hormone level)- looking for hyperparathyroidism

U/A – looking for casts (RBC, WBC, granular), eosinophiluria, and crystalluria

Urine creatinine, urine sodium- used to calculate FeNa (fraction excretion of sodium) to help differentiate prerenal renal failure from intrinsic renal failure. Does not work for patients on diuretics. FeNa <1% is usually prerenal, FeNa >1% is usually intrinsic disease

Urine creatinine, urine urea- used when a patient is on diuretics to calculate Fe Ur (fraction excretion of urea) to help differentiate prerenal renal failure from intrinsic renal failure. FeUr <35% is usually prerenal. FeUr >35% is usually intrinsic disease.

24 hour urine collection- calculate true creatinine clearance and proteinuria

Quantitative immunoglobulin class levels (IgG, IgA, IgM, IgE, IgD)- will identify increased type and reactive decrease of other classes

Beta-2- microglobulin- marker for multiple myeloma

CRP (c- reactive protein)- marker of inflammation

Bladder U/S (ultrasound)- will identify a dilated bladder

Renal U/S- will show small kidneys in chronic renal failure or hydronephrosis in obstruction

CXR (chest X- ray)- could identify primary malignancy or vasculitis

Renal artery Doppler scan- evaluate renal blood flow

MRI of spine- looking for multiple myeloma in the vertebral column that could cause cord compression syndrome

Bone Marrow Biopsy- looking for infiltration with malignancy.

Your patient had a hemoglobin of 8 with rouleaux formation on the smear, calcium was 13, BUN and creatinine were elevated with a BUN : Cr ratio of 10:1. Total protein was elevated, but albumin was normal. SPEP and UPEP showed a monoclonal spike of protein in the gamma region. Arm X-Ray showed a fracture in the humerus and a lytic lesion around the area. Skeletal survey showed multiple punched out lytic lesions. Fe Na was not calculated as patient is on a diuretic. FeUrea was 45%. 24 hour urine collection reveal Bence Jones proteinuria. Beta 2 microglobulin and CRP were elevated. Bone marrow biopsy showed >30% plasma cells (elevated). All other tests were normal.

### **What is the diagnosis?**

This patient has multiple myeloma (MM) and as a result has anemia, a pathological fracture, and acute renal failure. When a plasma cell mutates and begins overproducing antibodies the benign end of the spectrum is called monoclonal gammopathy of undetermined significance (MGUS), the pathological end is MM. When this occurs over 10 % of the bone marrow becomes plasma cells, the normal marrow components are crowded out. Additionally, osteoblastic factors are inhibited while osteoclastic factors are induced. The monoclonal B cells also inhibit proper immune function, especially to encapsulated organisms. These proliferative proteins can also clog and injure the kidney. The end result is that patients become anemic, have punched out lytic lesions, are immunosuppressed, have increased serum viscosity which can lead to strokes and kidney failure.

What you should take away from this case.

1. Multiple myeloma is the most common primary bone cancer. Mean age 62. African Americans more often than Caucasians.
2. Multiple myeloma can present many ways:
  - a. bone pain
  - b. pathological fracture
  - c. infection (meningitis or other infections)
  - d. bleeding
  - e. cord compression syndrome
  - f. hypercalcemia (nausea, fatigue, thirst, depression, etc.)
  - g. hyperviscosity (headaches, stroke)
  - h. neurologic symptoms (carpal tunnel, peripheral neuropathy, etc)
  - i. fever
3. Monoclonal Gammopathy of Undetermined Significance (MGUS) is a precursor to Multiple myeloma. Within 2-19 yrs, 19% of people with MGUS will proceed to MM. These patients need to be followed
4. Renal failure with MM is a bad prognostic sign
5. There is no cure for MM, only agents that slow the disease.

### **Treatment Summary**

1. chemotherapeutic agents- many available

2. bisphosphonates- for bony lesions
3. radiation- for bony lesions and cord compression
4. erythropoietin- for anemia
5. antibiotics- to treat secondary infections