

CHLOROMA OF THE FOREARM: A CASE REPORT OF LEUKEMIA RECURRENCE PRESENTING WITH COMPRESSION NEUROPATHY AND TENOSYNOVITIS

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ABSTRACT

Acute Myelogenous Leukemia (AML) typically involves intramedullary proliferation of myeloid precursor cells. Extramedullary manifestations of AML are exceedingly rare, but do occur. Granulocytic sarcoma, or chloroma, is one example of extramedullary leukemia cells forming a tumorous mass. We report a case of Chloroma in the volar forearm compartment presenting with both median nerve compressive neuropathy and apparent tenosynovitis. Abscess was at the top of the early differential, and the patient was scheduled for operative debridement. However, further evaluation indicated that chloroma was present, thus obviating the need for emergent surgical intervention and necessitating the induction of chemotherapy. To our knowledge this is the first report of chloroma in this location and with these presenting symptoms.

CASE REPORT

A nine-year-old female presented to the emergency room (ER) three years status post bone marrow transplant for AML, which had been in remission. She presented with two distinct complaints, both of the right forearm and hand. The first complaint was a progressive two-month history of paraesthesias in a median nerve distribution. The second complaint was a two-day history of increasing erythema and pain in the flexor tendons of the volar forearm compartment, most marked in the flexor pollicis longus and flexor carpi radialis. The pain was worsening at rest and increased with either passive or active extension of the wrist or fingers, especially the thumb. Overall, her clinical picture was concerning for both median neuropathy and for an evolving tenosynovitis. The patient had recently seen her local pediatrician and radiographs taken at that time did not show any acute skeletal abnormalities; the pediatrician scheduled a Magnetic Resonance Image (MRI) of the hand and forearm on an outpatient basis for further evaluation. The patient presented to the ER three days prior to her scheduled MRI due to the progressive nature of her

symptoms and the onset of erythema and pain in the flexor tendons that was new since being evaluated by the pediatrician.

In addition to the patient's AML, her past medical history was remarkable for a previous multi-organism bacteremia during AML treatment that included *Pseudomonas*, *Enterobacter*, and *Acinetobacter*. Family history was only remarkable for diabetes. There was no history of bone or hematologic cancers in the family. Her social history was noncontributory. Review of systems was negative for chest pain, shortness of breath, or fevers. The patient's mother stated that she did have flu like symptoms a few weeks prior to presentation, which included some nausea and diarrhea, but had not been febrile.

Examination of the patient's right forearm demonstrated erythema on the volar aspect of the forearm spanning from the wrist crease to approximately 2/3 proximally up the forearm. The maximum width of the erythema was approximately three cm. She noted subjective paresthesias on the volar aspects of the thumb, index, long fingers and the radial aspect of the ring finger. The dorsum of her hand was completely neurovascularly intact. Tinel's exam was negative at both the cubital and carpal tunnels. She held her hand in a fixed, flexed position and when asked to extend her thumb, she could do so only 15 degrees secondary to pain. With passive stretch of the fingers and wrist, she also noted pain in the forearm in the area of her erythema.

Laboratory data from the Emergency Room revealed relative neutropenia that was comparable to previous tests (2.6 k/mm³ on day of presentation vs. 3.9 k/mm³ six months prior). Hemoglobin and hematocrit were also relatively stable (hemoglobin of 10.8 g/dl and hematocrit of 31% on day of presentation vs. 12.2g/dl and 35%, respectively, six months prior).

The patient was admitted for diagnostic workup, including an MRI of the forearm and hand. She was also tentatively placed on the operative schedule in the event that workup revealed an inflammatory process or abscess that would require emergent debridement. MRI demonstrated a 9mm x8mm rounded lesion along the course of the median nerve in the forearm lying between the flexor pollicis longus and flexor carpi radialis muscles and tendons (Figure 1). The lesion demonstrated hyperintense signal on T2 FS images. Contrast images

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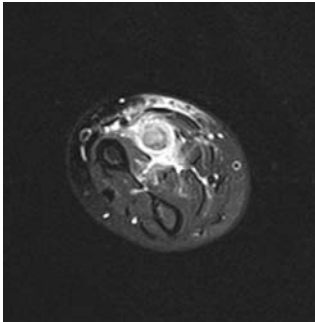


Figure 1. Axial T2 MRI images through demonstrating hyperintense signal of a rounded lesion surrounding the median nerve and lying adjacent to the flexor pollicis longus and flexor carpi radialis muscles.

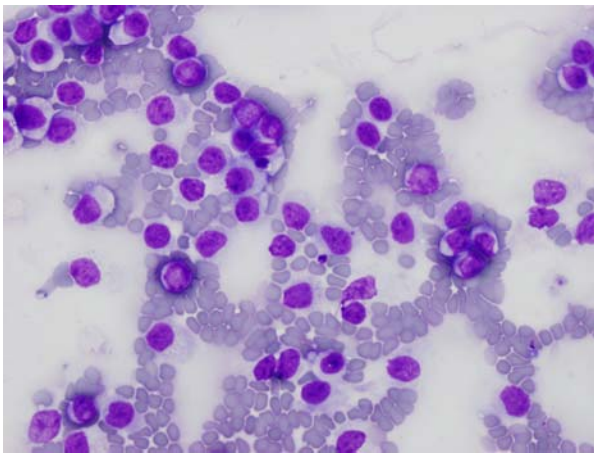


Figure 2. 60X Diff-quick stain on aspirated material from the right wrist, showing numerous immature hematopoietic cells.

showed peripheral enhancement of the lesion. The staff musculoskeletal radiologist felt that the MRI findings most strongly supported a diagnosis of abscess, but also felt chloroma or hematoma were possible. The patient was then made NPO in anticipation of emergent surgical debridement. However, given the patient's history of AML and the possibility that chloroma could account for the MRI findings, the Pediatric Oncology service was consulted prior to taking the patient to surgery. They felt chloroma could indeed account for both the patient's symptoms and MRI findings, and biopsy of the lesion prior to surgical intervention was recommended. Aspiration of the soft tissue of the right wrist, performed by ultrasound guidance, revealed numerous enlarged discohesive cells with a high nuclear to cytoplasmic ratio (Figure 2). The cytoplasm showed occasional vacuoles, and the nuclear chromatin pattern was fine and delicate with visible nucleoli demonstrating morphologically immature hematopoietic cells. Subsequent bone marrow aspiration and core biopsy showed hypercellular bone marrow comprised predominantly (83% of hematopoietic cells) of leukemic blasts (Figures 3, 4, and 5). Flow cytometric analysis from bone marrow aspiration material showed that the blasts were myeloid with monocytic

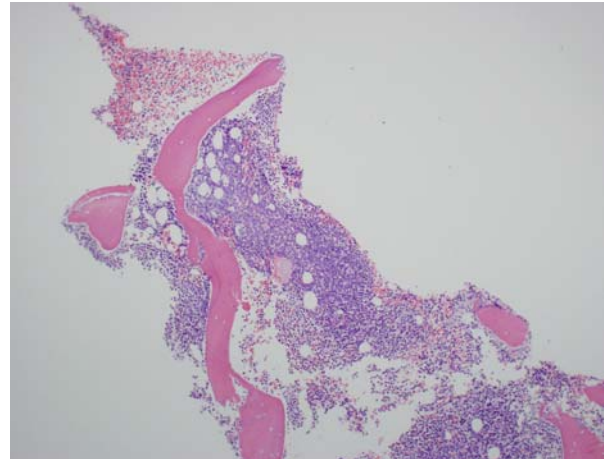


Figure 3. 100X Hematoxylin and Eosin stain of bone marrow core biopsy, showing a hypercellular marrow space.

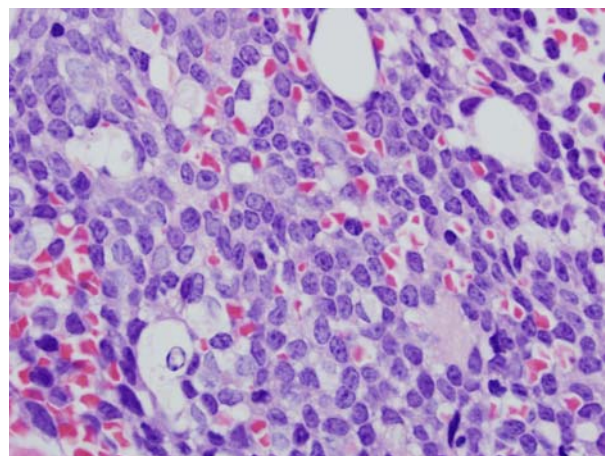


Figure 4. 100X Hematoxylin and Eosin stain of bone marrow core biopsy, showing numerous blasts.

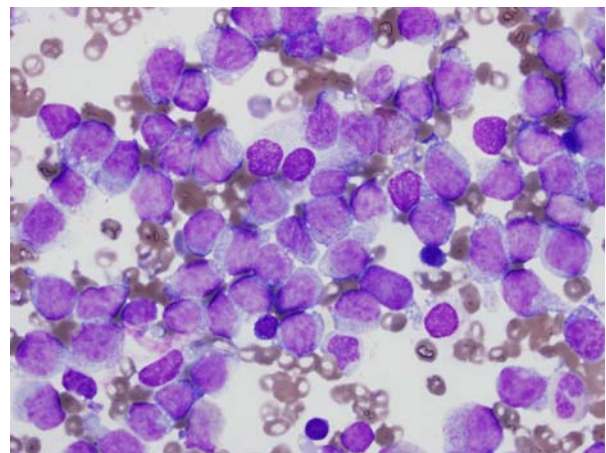


Figure 5. 100X Wright stain of bone marrow aspirate, showing numerous myeloid blasts.

differentiation, indicative of relapsed acute monoblastic leukemia.

The patient was started on chemotherapy including fludarabine, cytarabine, and G-CSF. She had a subsequent bone marrow biopsy read as negative. The patient has reported that both the numbness and pain in her hand improved significantly since starting chemotherapy. The erythema and limited range of motion have resolved. Her strength is full in all motor groups and her sensation is completely intact except for some subjective paresthesias and decreased sensation at the distal tip of her right thumb. Currently, the patient is awaiting a marrow infusion of cells from her father through the Bone Marrow Transplant Clinic.

DISCUSSION

Aggregates of extramedullary myeloid precursor cells associated with leukemia have traditionally been referred to as granulocytic sarcoma (GS) or leukemia cutis (LC). While GS generally refers to a mass of blast cells outside the bone marrow, LC lesions specifically refer to dermal infiltrations by blast cells.¹ GS masses have also been referred to as chloroma secondary to their characteristic green color created by the presence of myeloperoxidase.^{2,3} Collectively, all forms of extramedullary leukemia are rare, and most lesions are associated with medullary leukemia. An isolated chloroma discovered in a patient with a remote history of AML obligates a diagnosis of bone marrow relapse until proven otherwise because primary lesions without underlying systemic leukemia are so rare; indeed, only 154 cases have been reported since 1965.^{4,5} Conversely, Pui et al (1994) found that of children with AML, only 4.7% had an identifiable chloroma.⁶ Risk factors for the development of extramedullary manifestations of leukemia have been associated with low socioeconomic class, decreased cellular immunity, and poor nutrition.⁷

Large clinical reviews suggest that the most common location for chloroma is in the skin, bone, soft tissues, and lymph nodes. Most frequently patients present with a history of AML. On rare occasions the patient will be diagnosed with the chloroma without a primary diagnosis of AML, but in almost all of these cases the patients went on to develop AML within 2 years.⁸ The symptoms most frequently are associated with either the mass itself or disturbance of the organ with which it is associated. Cases of chloroma have been reported in the CNS and spinal canal with associated symptoms of compression such as radiculopathy or cauda equina syndrome. Peripheral nervous system involvement seems to be much less common and a precursory review of the literature shows only two cases which include a facial nerve palsy and involvement of the sciatic nerve.

Treatment for chloromas consists of systemic chemotherapy for the underlying leukemia, and the lesions frequently respond well. When urgent decompression is needed, or if the lesion is refractory to systemic chemotherapy, then surgical debridement or radiation therapy may be considered. The response to systemic therapy is much greater in patients presenting with new onset AML compared to those that are presenting with relapse. Unfortunately, chloromas can be resistant to traditional induction chemotherapy,⁹ and they are a poor prognostic factor for the response to chemotherapy in patients with AML.

In conclusion, the chloroma discussed in this report was unique with respect to both its location and symptomatology. Missing this diagnosis would have led to unnecessary surgery and increased morbidity to the patient. Albeit extremely rare, orthopedists should be aware of chloromas when evaluating a local mass of unknown etiology, especially in patients with a known history of AML. Knowledge of this diagnostic possibility can expedite treatment for the patient and eliminate unnecessary procedures.

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