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Case Report

Subdural hematoma with extramedullary hematopoiesis

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Abstract

Subdural bleeding is commonly associated with trauma and is often associated with tearing of bridging veins. In rare cases, evidence of extramedullary hematopoiesis has been described in association with a subdural hematoma. This paper reports a case of a 77-year-old male with a history of metastatic prostate cancer, hypertension, anemia and type 2 diabetes who presented to the emergency room with a persistent headache and inability to maintain his balance. A computed tomographic (CT) study showed evidence of bilateral hemispheric subacute and chronic subdural hematomas. Surgical evacuation of a lesion on the right and left side of the brain was performed. Examination of histologic sections showed evidence of an organizing subdural hematoma along with erythroid and megakaryocytic precursor cells, consistent with extramedullary hematopoiesis. The literature on this phenomenon will be briefly reviewed.

Keywords: brain, extramedullary hematopoiesis, hemorrhage, subdural hematoma

Introduction

Subdural hematomas are a well-recognized finding associated with trauma sustained from a fall, motor vehicle accident or assault due to tearing of cortical bridging veins. Patients with underlying coagulopathies and hematopoietic disorders are also at risk of developing a subdural bleed. Surgical evacuation is employed in cases in which pressure due to the hematoma causes symptoms by bleeding. Rarely, evidence of extramedullary hematopoiesis i.e. hematopoietic elements outside of the bone marrow has been documented in the pathologic examination of excised organizing hematomas [1-6]. Extramedullary hematopoiesis is most commonly encountered during embryonic development or early in life most commonly in the liver, yolk sac and spleen [7]. This paper will present a case of a 77-year-old male who had bilateral subdural bleeds and evidence of early erythroid and megakaryocytic elements upon examination of the resected tissue. Given the presence of atypical appearing immature hematopoietic elements and the appearance of a lesion on imaging, confusion of these findings with malignancy should be avoided.

Case

The patient was a 77-year-old male with a past medical history of hypercholesterolemia, hypertension, anemia, type 2 diabetes, deep venous thrombosis with inferior vena cava filter placement and metastatic prostatic cancer to bone on Lupron. He presented with headache

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and an inability to maintain balance. He had admitted to having a fall about a week prior but indicated that he had not hit his head. A computed tomographic (CT) study of the head showed bilateral hemispheric subacute and chronic subdural hematomas. One on the left was associated with a 1 cm left to right midline shift. His blood work by examination was notable for a low hemoglobin of 9.0 g/dL (normal 13.8-17.2 g/dL), a platelet count of 139,000/mL (normal 150,000-350,000/mL), a prothrombin time (PT) of 11.2 seconds (normal 11-13.5 seconds) and PT INR of 1.0 (normal 0.8-1.1).

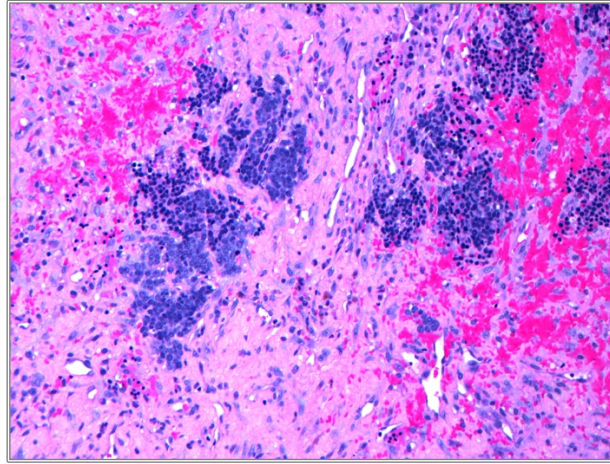


Figure 1. Evidence of recent bleeding and an organizing subdural hematoma marked by collections of atypical cells, worrisome for a malignancy (hematoxylin and eosin, original magnification 200X).

The patient underwent surgical evacuation of hematomas on both the right and left sides. Histologically, fresh blood was noted in the hematoma evacuated from each side. The left lesion also showed evidence of organization with granulation tissue with chronic inflammation, small blood vessel proliferation and hemosiderin deposition. Additionally, clusters of atypical appearing cells were noted in the organizing hematoma [Figure 1]. The cells demonstrated a monomorphic appearance with scant cytoplasm. Immunostaining of the cells showed that many of them demonstrated diffuse strong staining with CD71 antibody (prediluted; Leica Biosystems, Buffalo Grove, IL) [Figure 2].

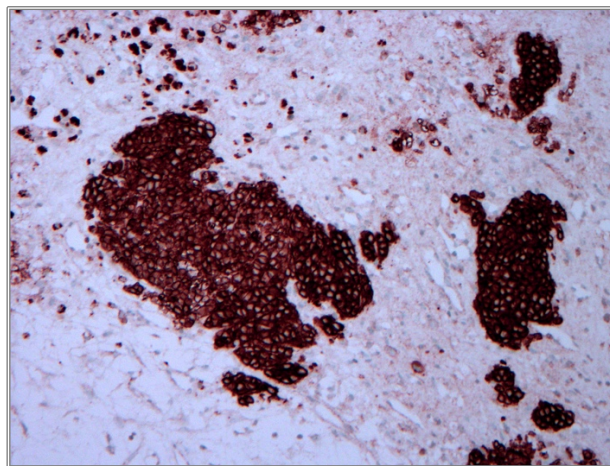


Figure 2. CD71 immunostaining shows that many of these atypical cells are positive, consistent with erythroid precursor cells (original magnification 200X).

E cadherin (1:250 dilution; Invitrogen, Carlsbad, CA) immunoreactivity was also observed in a subset of these cells. A subset of cells also demonstrated positive staining with CD61 (prediluted; Leica Biosystems) [Figure 3]. Scattered benign-appearing lymphocytes were noted with staining with antibodies to CD45 (1:100 dilution; DAKO, Carpinteria, CA), CD3 (prediluted; Ventana Medical Systems, Oro Valley, AZ) and CD20 (1:200; DAKO). Some of these inflammatory cells also demonstrated staining with antibody to leukocyte marker CD43 (1:25 dilution; DAKO). CD34 (prediluted; Cell Marque, Rocklin, CA) staining showed a proliferation of small caliber blood vessels in the organizing hematoma and showed that the atypical cells were extravascular in location. There was no evidence of a small cell carcinoma

on staining with antibodies to cytokeratin CAM 5.2 (1:10 dilution; BD Biosciences, San Jose, CA) and neuron-specific enolase (1:50 dilution; DAKO).

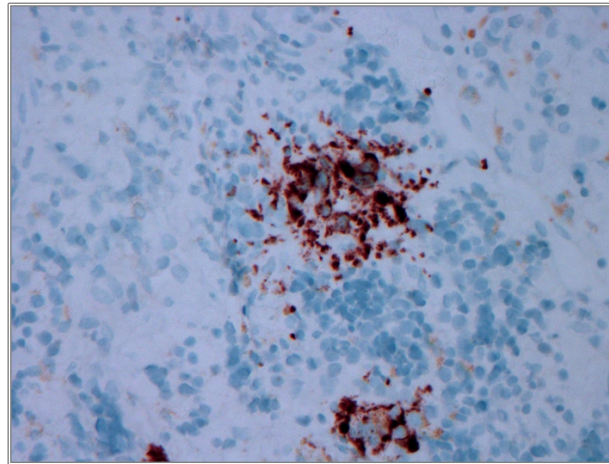


Figure 3. CD61 immunostaining highlights focally the presence of megakaryocytic precursor cells in the organizing hematoma (original magnification 400X).

Discussion

In 1966, Slater reported the first case of extramedullary hematopoiesis with a subdural bleed [3]. The patient was a 4-month-old girl who presented with increased head circumference due to bleeding [3]. An angiogram revealed a massive subdural hematoma covering each hemisphere. Subdural taps were performed and examination of the subdural fluid revealed the presence of early red blood cell precursors. The author hypothesized that the erythroid precursor cells may have “leaked from the cranial marrow through some unseen channel into the subdural space” or the cells may have originated within the subdural space related to either a congenital anomaly or in response to the child’s anemia [3].

In 1988, Müller et al found evidence of erythroblasts in chronic subdural hematomas in 41/130 cases they examined [5]. Erythroblasts were not found in the peripheral smears in any of these cases and the source of these cells was uncertain [5]. The impact of their presence on the clinical course of the chronic subdural hematoma was reported as unknown.

Other hypotheses regarding the mechanism of the extramedullary hematopoiesis in this setting have been proposed. In cases in which the marrow space may be compromised (i.e. in patients with bone metastases, which the current patient had, or myelofibrosis), it may represent a compensatory process due to increased numbers of circulating hematopoietic stem cells [1,8]. Koch and colleagues also hypothesized that perhaps stem cells of different tissue types may differentiate into hematopoietic stem cells when induced by factors which are upregulated by anemia or other hematologic disorders [8]. Similar cases have been reported in patients with anemia conditions such as thalassemia, polycythemia vera and chronic myeloid leukemia [9-11]. Rare cases of extramedullary hematopoiesis have been described in associated with intracranial tumors, such as hemangioblastoma and meningioma [12,13].

From a practical standpoint, the atypical cells encountered in extramedullary hematopoiesis can conjure up a differential diagnosis of malignancy. The clusters of atypical cells in the current cases raised a differential diagnosis including leukemia, lymphoma and metastatic small cell carcinoma. The CD34 stain, a vascular endothelial marker, highlighted the fact that the atypical cells were all extravascular [14]. The immunostains evaluated in the current case helped sort through the differential and arrive at the determination that the cells were hematopoietic [15,16]. Kuhn et al similarly reported on two cases of extramedullary hematopoiesis within chronic subdural hematomas that caused diagnostic confusion; in fact, both cases were initially diagnosed as metastatic malignant tumors by the pathologists who first reviewed the cases [2]. So, caution should be taken in properly evaluating such cells when encountered to ensure that a proper diagnosis is made.

Conflict of interest

The author declares no conflict of interest.

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