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Diagnostic Value of Processing Small Fragments of Bone Marrow Tissue Obtained During an Unsuccessful Attempt to Obtain an Adequate Trephine (Core) Biopsy Specimen

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ABSTRACT

During bone marrow trephine (core) biopsy procedures for hematological diagnosis, it is not uncommon to obtain only small fragments of bone marrow tissue that are considered to be unsatisfactory for histological evaluation and are often discarded. We report a case where small fragments of marrow tissue were obtained during an unsuccessful attempt to obtain an adequate trephine (core) biopsy sample that provided material sufficient to make an accurate diagnosis.

Keywords: Bone Marrow; Trephine (Core) Biopsy; Immunohistochemistry; Fragment of Biopsy; Diagnostic Value

Introduction

Bone marrow trephine biopsy specimens are critical for the evaluation of patients with suspected or confirmed hematopoietic disorders [1-4]. The ability to detect disease in such biopsy specimens depends on obtaining an uncrushed trephine biopsy sample of sufficient length [5,6]. Bone marrow aspirations from the sternum or the posterior ilium and the cytological smears produced from them are widely used in the diagnosis and management of patients with various hematological disorders [7,8]. However, a definitive cytological diagnosis becomes difficult when the bone marrow aspiration is a dry tap. The latter is not uncommon when the marrow is packed with malignant hematopoietic cells, carcinoma, or is associated with myelofibrosis [9-12]. In such circumstances, an adequate trephine biopsy becomes essential in the diagnostic evaluation of bone marrow for hematopoietic disorders. In these and some other conditions, it is not uncommon to get only one or two very small fragments of marrow tissue which may be considered unsatisfactory for any histological evaluation and are not processed. We report a case where bone marrow aspirate was a dry tap but sections prepared from the small fragments of marrow tissue obtained following a dry tap helped make an accurate diagnosis which might have been otherwise missed if the fragments were discarded because of the unsatisfactory nature of the sample size.

Patient and Methods

An 85-year-old African American male patient was referred to our hospital for the evaluation and management of anemia and leukopenia. He did not have any major complaints except for weight loss for 6 months. His physical examination was unremarkable except for pallor and slight splenomegaly as evidenced by CT scanning. His laboratory values were WBC 2.5 x 109/L, hemoglobin 10.7 g/dl, normal MCV at 98.9 fl, and MCH at 28.5 pg, and an adequate platelet count of 188 x 109/L. A manual differential of his peripheral blood smear revealed neutrophils at 53.0%, lymphocytes at 42.0%, monocytes 3.0%, eosinophils 2%, and basophils at 0%. His iron studies as well as vitamin B12 and folic acid levels were normal. His complete metabolic profile was normal, but his ESR was raised to 83 mm/hr (n 0-12). The reticulocyte count was normal at 3.6%. His stool occult blood test was negative X3. His PSA, fasting lipid and thyroid profile were unremarkable. A bone marrow aspiration was a dry tap but two small fragments of marrow containing bone (Figure 1) obtained during the unsuccessful attempt to obtain an adequate bone marrow trephine (core) biopsy specimen revealed cortical and trabecular bone and hypercellular marrow (60%) for patients age (Figure 2). The marrow revealed an extensive small cell lymphoid infiltrate (Figure 3) in an interstitial, diffuse and nodular pattern. The residual hematopoietic marrow was composed of scattered megakaryocytes and maturing myeloid and erythroid precursor cells. The M:E ratio was reduced. No clusters of plasma cells nor aggregates of blast cells were appreciated. Immunohistochemical and special stains were performed with appropriate controls. The neoplastic B-cells were positive for CD20 (Figure 4), PAX5, CD5 (Figure 5), BCL2 with low MIBI – positivity (<5%) and negative for CD10, cycline D1, BCL-6 and MUM-1. A diagnosis of chronic lymphocytic leukemia/small lymphocytic lymphoma was made. Soon after the diagnosis the patient acquired a COVID-19 infection and expired at home as per families wish.

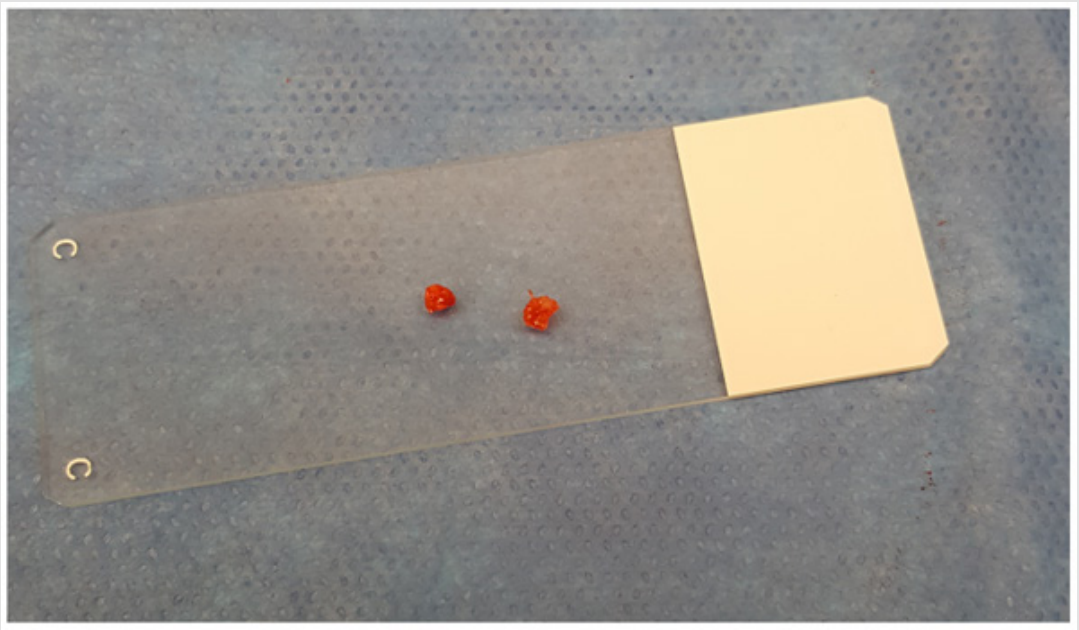

Figure 1: Two small fragments (2-3 mm) of marrow containing bone obtained during an unsuccessful attempt to obtaining an adequate length bone marrow trephine (core) biopsy specimen.

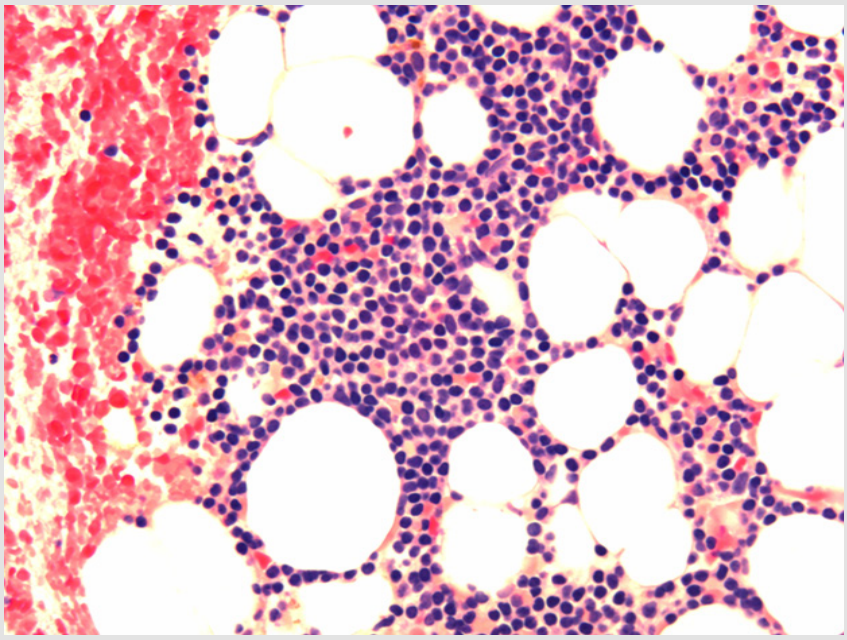

Figure 2: H & E-stained Section of the Bone Marrow Biopsy Fragment Demonstrating a Hypercellular Marrow with Infiltration by Lymphoid Precursor Cells.

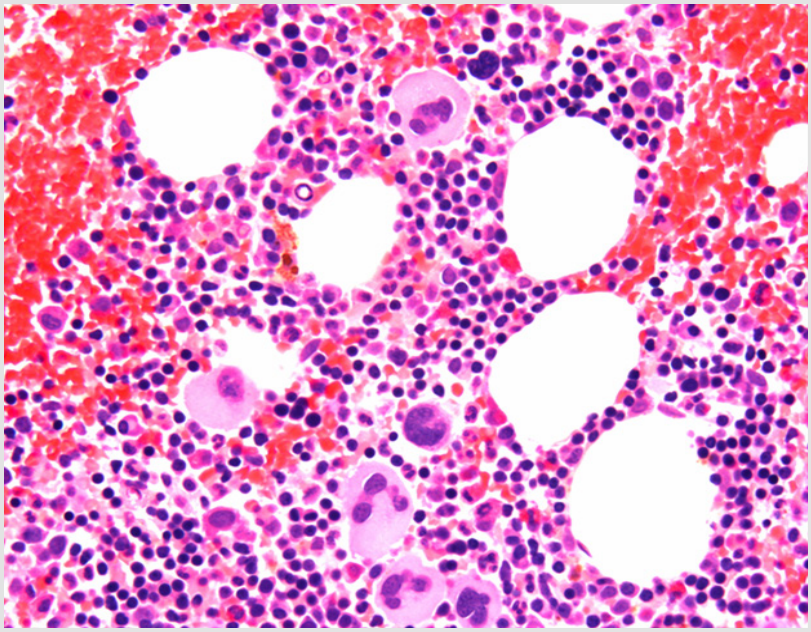

Figure 3: Same Section as in Figure 1 but another area Showing Scattered Megakaryocytes.

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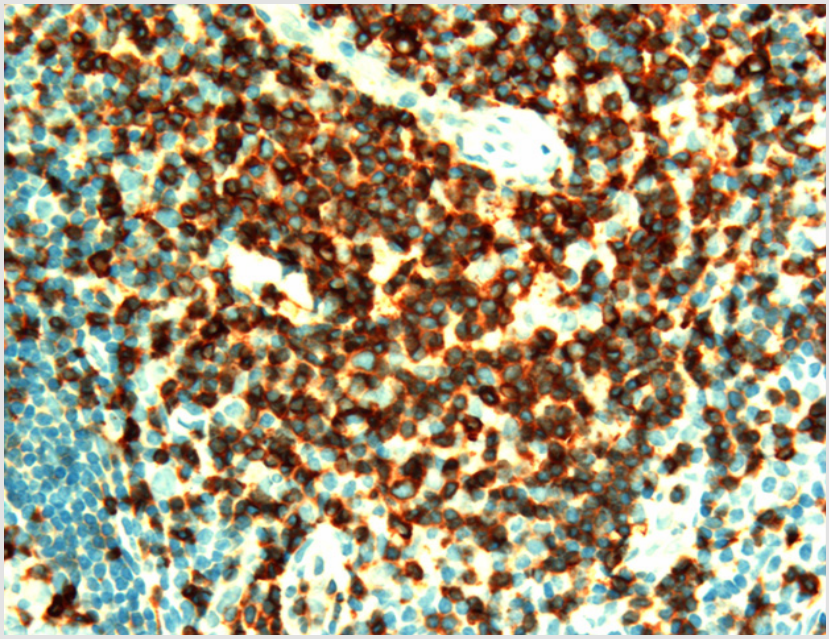

Figure 4: Same Section as In Figure 1 Stained for CD19 Showing CD19 Positive Cells.

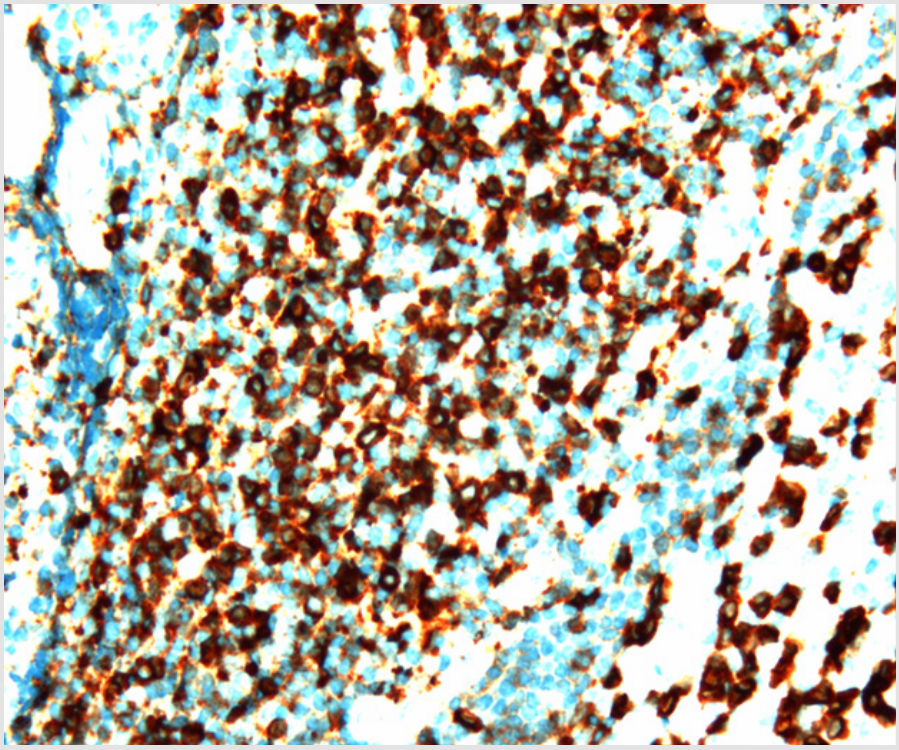

Figure 5: Same Section as in Figure 1 Stained for CD5 Showing CD5 Positive Cells.

Discussion

Small fragments of bone marrow tissue obtained during an unsuccessful attempt to procure a desired long core trephine biopsy specimen typically means a technical failure to obtain an adequate specimen either due to poor quality instrumentation [13] or a new, poorly trained, or inexperienced operator [14]. Sometimes, it can also occur even in skilled hands particularly if the patient is obese or if the bone is too soft as in cases of osteoporotic marrow. Cytomorphological and histopathological evaluation of a bone marrow aspirate and trephine biopsy specimen is considered essential to make a valid diagnosis in cases such as leukemia, lymphoma, multiple myeloma, and other hematological and non-hematological disorders [15-20]. Although trephine biopsy specimens of adequate length (15 mm) and uncrushed tissue are useful in diagnosis however when only small fragments (2-3 mm) are obtained they may still provide valuable information either to complement or even to make a diagnosis. If the dry tap is genuine and not due to technical reasons (as mentioned above) it usually indicates significant marrow pathology which is usually associated either with marrow fibrosis or hypercellularity (packed marrow) or both. The predominant conditions associated with a dry tap usually include leukemias, particularly chronic myelogenous leukemia, chronic lymphocytic leukemia, hairy cell leukemia, metastatic solid tumors, and idiopathic myelofibrosis. The topic of dry taps and inadequate biopsy sample retrieval has received little attention in recent years and the diagnostic value of preparing small fragments of marrow tissue has largely been ignored. This report demonstrates that when only small fragments of bone marrow tissue are obtained the processing and microscopic examination of sections can reveal useful information and may provide the only material available to yield correct diagnostic information.

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