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Case Report

Imprint Cytology - A Primary Diagnostic Tool to Bone Marrow Pathology

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A B S T R A C T

The bone marrow is generally considered the fourth largest organ in the human body. In pediatric age group (up to 17 years) disease diversity and presentation is unique and that necessitates bone marrow examination (aspiration/ biopsy/ imprints. Imprint cytology gives excellent morphology and quick diagnosis and these procedures are well tolerated by patients. A pathologist faces many situations where either the aspirate is hemodiluted or it's a dry tap. Dry taps can be due to marrow fibrosis or when marrow is packed with blasts. Here imprint cytology can be of an early help.

We present a case in brief where the imprint helped in early diagnosis. A one-year old female presented with complaints of fever for 1 month. In this case the aspirate was hemodiluted and inconclusive while the biopsy reporting would have taken time and due to patient being critical a quick report was needed to start clinical management at its earliest. Here imprint cytology saved the time and helped the pathologist to give the clinician a diagnosis of acute leukemia.

Hence we discuss the importance of imprint cytology in early and quick diagnosis specially where aspiration is non contributory.

Keywords: Bone, Marrow, Imprint, Early, Diagnosis, Aspiration, Non-Contributory

Introduction

The bone marrow is generally considered the fourth largest organ in the human body and is composed of cells derived from variety of lineages including stromal cells, adipocytes, lymphocytes and hemopoietic precursors.[1] In pediatric age group (up to 17 years) disease diversity and presentation is unique and that necessitates bone marrow examination (aspiration/biopsy/imprints) along with ancillary investigation to propose the exact diagnosis. Bone marrow aspiration offers good cytomorphological details, biopsy tells about exact cellularity, architecture, metastatic deposits and staging. Imprints give excellent morphology and quick diagnosis and these procedures are well tolerated by patients. However, there are times when both aspiration and biopsy fail a pathologist in making a diagnosis and an imprint turns out to be the saving grace.

Case

We present one such case in brief where the imprint helped in early diagnosis. A one-year old female presented with complaints of fever for 1 month. Clinically no organomegaly

or lymphadenopathy seen. Her routine peripheral blood examination revealed pancytopenia with no blasts. Her Hemoglobin/ TLC/ platelet count were as follows 1.6 gm/ dl, 2090/ cu.mm and 1000/cu.mm. Written informed consent was taken and a bone marrow aspiration, imprint and biopsy were done to arrive at a diagnosis. Her bone marrow aspiration smears and a 1.5 cms biopsy tissue were processed in dept. of pathology, Super Specialty Paediatric Hospital & Post Graduate Teaching Institute. The aspirate yielded some blood mixed necrotic material. The bone marrow smears were examined by two independent pathologists and revealed similar findings of blood mixed eosinophilic necrotic material with few blasts at the periphery of the smear. However, her imprint smears show sheets of blasts (>90%) morphologically resembling a lymphoblast which were PAS positive, suggestive of Acute leukemia, probably Acute lymphocytic leukemia (ALL). The biopsy took 1 week to process meanwhile based on imprint reports her flowcytometric analysis of bone marrow aspirate was performed which came out to be positive for, TdT, HLAdr, CD45, which confirmed the diagnosis of ALL. Her biopsy revealed viable areas with lymphoblasts as well as foci of necrotic areas (Figure 1-4). Hence, a diagnosis of Acute Lymphoblastic Leukemia was given. The patient was started on chemotherapy and expired during induction phase.

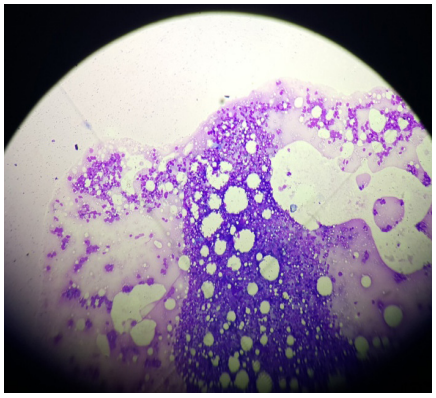

Figure 1.Imrpint smears packed with blasts (10x)

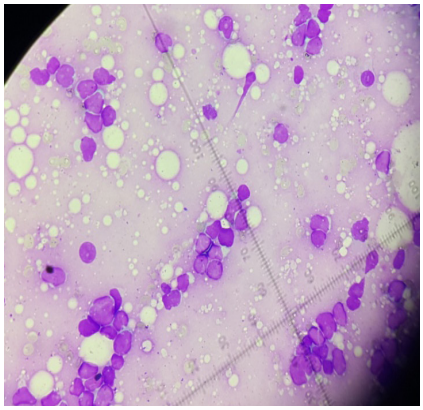

Figure 2.Blasts in imprint smears (40x)

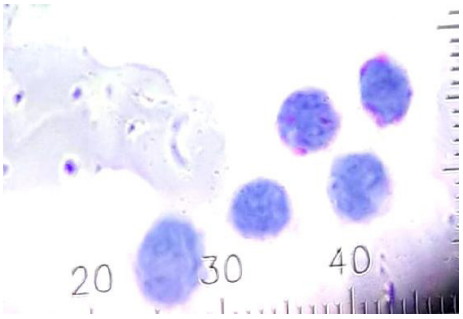

Figure 3.PAS positive blasts (block positivity) of ALL (100X)

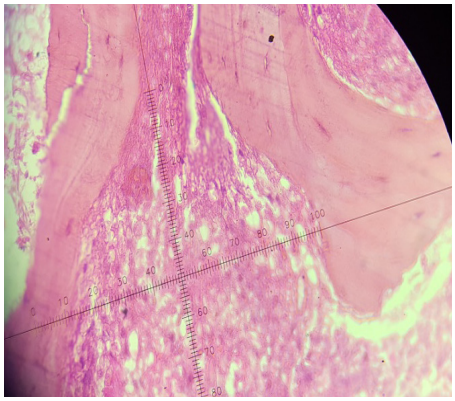

Figure 4.Biopsy showing blasts in bone marrow (10x,H&E)

Discussion

The role of bone marrow evaluation serves as a useful diagnostic tool in many haematological disorders originating and/ or infiltrating the marrow, as well as many non-haematological disorders documented to have bone marrow involvement. Bone marrow study entails analyzing the aspirate smears (BMA), imprint or touch preparations (BMI) and core biopsies (BMBx) Evaluation of BMA/BMI smears is rapid and effective method of early diagnosis as the biopsy undergoes decalcification and processing before it can be analyzed. Imprint smears play a vital role in early diagnosis especially where the marrow aspirated is hemodiluted or the procedure is a dry tap due to disease or incorrect technique. Therefore, imprint smears can serve as early diagnostic tool in critical cases.

Bone marrow aspiration will not reveal much other than component of blood and occasional osteoblasts or osteoclasts when suboptimal sampling is done however an imprint smear even with suboptimal marrow sampling can give idea about the cellularity and cell morphology. This was the case with the samples that we had received for reporting. Also, as personal experience I have seen that imprint smears give better cytomorphological delineation, so special stains like PAS, MPO, or Perls stain for presence of siderocytes is better appreciated on an imprint than aspirate smears.

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Although standard WHO classification describes aspiration and biopsy findings to establish criteria for diagnosis of hematological malignancies the role of imprint smears is not emphasized upon, undermining its significance.

In one study there was 61.5% concordance in the cellularity of BMI with cellularity of BMA smears which was comparable with the observation of study by Gong X et al.[2]

In another study there was discordance in the interpretation of aspiration versus imprint of 22 cases, which was due to presence of hypoplastic MDS or Aplastic anemia.[3] One author in his study found that BMI smears were more helpful, as they were prepared by gentle touch and rolling of core biopsy over glass-slides so that impression of the cells were made by almost all aspects of the core biopsy. This procedure will enhance the detection of focal involvement of marrow also.[4]

Whenever a trephine biopsy is obtained, Imprints can be taken before the specimen is transferred to the fixative. This is particularly useful when an aspirate is inadequate or diluted. The core is gently dabbed or rolled across the slide and then fixed and stained like a bone marrow film. This ensures immediate examination of the cells that stick to slide surface while rolling and shortens the wait period for the report which one would have when processing the biopsy.

Since bone marrow biopsy is considered gold standard to ascertain cellularity, assessment of cellularity by imprint smears revealed a 78.5% concordance in the diagnosis with that of a biopsy while concordance of BMBx and BMA cellularity was only 71.4%.[5]

The spreading quality of BMI was found to be better than BMA since it's an exfoliative cytology where cells attached to the core surface are gently touched to the slide surface, Aspirates are spread like smears or crushed and spread thus causing some morphological distortion.

Cellularity in aspirates is assessed by analyzing the particles and their trails while in imprint it assessed on basis of cell density. In addition, assessment of marrow iron stores is better on imprint than aspirates. Biopsies are not recommended for iron estimation due to chelating effect of decalcification.[6]

Conclusion

Our case concludes that BMI cytology is unquestionably important for diagnosis of bone marrow pathologies. Through the diagnostic accuracy achieved in our case (on imprint/ touch preparation) we want to reinforce the importance of routine study of BMI (with aspiration and biopsy interpretation) in early diagnosis of bone marrow pathology. In our case quick treatment and management could be initiated due to early diagnosis. However, for exact assessment of the bone marrow BMBx is the gold standard technique.

Conflict of Interest: None

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