Diagnostic Assessment of Bone Marrow Aspiration Smears, Touch Imprints and Trephine Biopsy in Non-Haematological Disorders

Nitin Gupta, Ram Kumar, Arvind Khajuria

Abstract
Diagnostic Assessment of bone marrow aspirate particle smears, imprints and biopsy sections was done on 10 Non-Haematological disorders. Core needle biopsy of the bone marrow is a safe and useful procedure. It is a valuable diagnostic aid for measurement of marrow cellularity, metastatic tumours and fibrosis. Bilateral trephine biopsy was conducted wherever necessary. Touch imprints were useful for studying cell morphology, where aspiration yielded dry tap. All the three procedures of bone marrow aspiration, trephine biopsy and touch imprints were found to be complementary to each other and superiority of one method over the other depended on the specific disease process.

Key Words
Non-Hematological, Trephine Biopsy, Bone Marrow Aspiration

Introduction
Marrow biopsy by surgical trephine is an older procedure than needle aspiration. It is only since the late 1950s that core needle biopsy of the bone marrow has been widely used. Since that time, it has had a considerable effect on diagnostic haematology, pathology and oncology. Wide acceptance is associated with the introduction of a simple procedure using the Jamshidi needle to improve the procedure, as well as the quality and size of specimens. The uses and advantages of needle biopsies are numerous (1-3). Metastatic deposits, degree of cellularity, fibrosis and assessment of dry taps can readily be determined. The present study is conducted to evaluate the role of bone marrow aspiration, touch imprints and trephine biopsy in order to optimize diagnostic utility of bone marrow examination which would be of immense value in better patient management.

Material and method
This study has been conducted at the Post Graduate Department of Pathology, Acharya Shri Chander College of Medical Sciences and Hospital, Sidhra, Jammu (J&K). All the patients referred to the Department of Pathology, Acharya Shri Chander College of Medical Sciences and Hospital, Sidhra, Jammu for diagnosis requiring bone marrow examination in non-haematological disorders were considered for participation in the study. After detailed haematological investigations, the commonly encountered anaemias i.e iron deficiency anaemia, megaloblastic anaemia and haemolytic anaemia were not included. Only those disorders where trephine biopsy is of utility along with bone marrow aspiration were considered eligible for the study. The standard technique was employed in obtaining the samples from posterior iliac crest using a Jamshidi needle. For preparing the aspirate particle smears, about 0.25 to 0.5 ml of aspirate was obtained into a syringe and delivered onto clean glass slides and smears prepared. The biopsy imprints were made by gently touching the core on slides. The cores were then fixed in Zenkers formalin, decalcified, embedded in paraffin and 2 um thin sections made. The particle smears and biopsy touch preparations were stained by the Wright-Giemsa and the biopsy sections were stained by the Wright-Giemsa and haematoxylin and eosin methods. In addition Gomori's reticulin stain and prussian blue stain for iron were also performed.

Results
Table-1 shows the distribution of Non-Haematological disorders. Metastatic tumour deposits were observed to be the most important cause of secondary bone marrow involvement by a non haematological disorder accounting for 8 out of 10 cases (80%). Out of these, 3 cases were of adenocarcinoma stomach, 2 cases were of adenocarcinoma lung, 2 cases were of prostate cancer.
and 1 case was of neuroblastoma. Haematological parameters provided valuable information about various disorders e.g. the two cases diagnosed as tuberculosis on bone marrow examination presented initially with history of long standing fever and weakness. A normocytic mildly hypocromic anaemia with mild lymphocytosis and a persistently raised ESR >50 mm in 1st hr. were the only positive haematological findings. PCR for mycobacterium tuberculosis was confirmatory. Tear drop cells along with positive haematological findings. PCR for mycobacterium persistent raised ESR >50 mm in 1st hr. were the only hypochromic anaemia with mild lymphocytosis and a of long standing fever and weakness. A normocytic mildly hypochromic anaemia with mild lymphocytosis and a persistently raised ESR >50 mm in 1st hr. were the only hypochromic anaemia with mild lymphocytosis and a.

Discussion

In our study of the Non-Haematological disorders, metastatic bone marrow disease with 8 cases was the commonest Non-haematological disorder observed. Out of these, 3 cases were of adenocarcinoma stomach. 2 cases each of adenocarcinoma lung and prostate cancer and 1 case was of neuroblastoma. Ozkalemkas et al (1) in their study observed the most common non haematological malignancy involving the bone marrow to be adenocarcinoma with the primary focus in stomach in 5 cases, prostate in 3 cases and lung in 1 case. These findings are comparable to those in our study. Sabharwal et al (2) in their study found metastatic cancer with 3 cases to be the most common non-haematological disorder of bone marrow. Out of these, 2 cases were of squamous cell carcinoma and 1 was of adenocarcinoma. Among the non-haematological disorders, both bone marrow aspiration and trephine biopsy were complementary in all the 8 cases of metastatic deposits. While aspiration smears were observed to be most effective for studying cellular morphology, biopsy on the other hand, was helpful in assessing marrow cellularity and for diagnosing granulomatous involvement such as tuberculosis. Our findings are comparable to the study by James et al (3) who observed that combined procedures of aspiration and biopsy gave a higher yield and are essential in patients with suspected carcinoma. Mills (4) in his study observed that bone marrow aspiration is frequently not helpful in the diagnosis of carcinomatosis, but it is important that both aspirated and biopsy material should be examined together, since the two methods are often complementary. Bird and Jacobs (5) proposed that examination of material obtained by aspiration combined with a trephine biopsy allows for the most thorough

Table 1. Non-Haematological Disorders

<table>
<thead>
<tr>
<th>Disorder</th>
<th>No. of patients</th>
<th>%age</th>
</tr>
</thead>
<tbody>
<tr>
<td>Metastatic deposits</td>
<td>8</td>
<td>80</td>
</tr>
<tr>
<td>Tuberculosis</td>
<td>2</td>
<td>20</td>
</tr>
<tr>
<td>Total</td>
<td>10</td>
<td>100</td>
</tr>
</tbody>
</table>

Table 2. The Iron Content in Bone Marrow Aspiration Smears and Bone Marrow Trephine Biopsy Sections Using Perls' Stain is as Follows

<table>
<thead>
<tr>
<th>Disorder</th>
<th>Iron stores</th>
</tr>
</thead>
<tbody>
<tr>
<td>Metastatic deposits (n=8)</td>
<td>Reduced iron stores(0 to 1+) (n=2)</td>
</tr>
<tr>
<td></td>
<td>Normal iron stores(2+ to 3+) (n=6)</td>
</tr>
<tr>
<td>Tuberculosis(n=2)</td>
<td>Normal iron stores2+ (n=1)</td>
</tr>
<tr>
<td></td>
<td>Reduced iron stores(0 to 1+) (n=1)</td>
</tr>
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morphological assessment of the marrow based on 10000 examinations. Atac et al (6) in their study observed that marrow aspirates and biopsies were useful and complementary examinations for identifying metastatic malignancy.

Amongst the non-haematological disorders, trephine biopsy was complimentary to bone marrow aspiration for diagnosing metastatic deposits in all the 8 cases (80%) and also in diagnosing the 2 cases (20%) of tuberculosis. Ellis et al (7) showed that bone marrow biopsy sections were of specific diagnostic value in those cases of bone marrow metastases whose diagnoses were not apparent from bone marrow aspirate. Sabharwal et al (2) in their study also observed trephine biopsy to be positive in all the 3 cases of metastatic deposits. Contreras et al (8) observed that trephine biopsy showed evidence of tumor in 94% patients, while the aspirate was positive in only 43%. Their results pointed to the superiority of the bone marrow biopsy over the aspirate in the diagnosis of metastatic carcinoma.

Bilateral trephine biopsy was essential in 3 cases (30%) of metastatic disease. These findings are comparable with the study of Brunning et al (9) who observed that bilateral trephine bone marrow biopsies should be routinely performed when searching for tumor in the bone marrow. Similarly, Menon and Buchanan (10) recommended that bilateral trephine biopsies should be performed when knowledge of the state of the bone marrow was important for clinical decision making. In our study, touch imprints gave better assessment in 6 out of 8 cases (75%) of metastatic deposits than aspiration smears and provided diagnosis earlier than trephine biopsy. In a study James et al (11) diagnosed 6 out of 22 cases (27.27%) of metastatic carcinoma on touch imprints. Kjurkchiev and Valkov (12) in their study also observed that the examination of touch imprints from bone marrow trephine biopsies is a rapid, reliable and sensitive method which can be used as a first step for the detection of metastases from malignant epithelial neoplasms. Lu et al (13) in their study observed that marrow imprint is better than bone marrow smear for evaluating cellularity. Similarly, Pasquale and Chikkappa (14) observed that biopsy imprints were positive in 19 out of 21 cases (90%) of metastatic deposits which showed that the biopsy imprint is an accurate modality for identifying non haematological tumor metastasis in the bone marrow.

The present study also attempted to comparatively evaluate the quality of Perl's staining for iron on aspiration films, imprint smears and biopsy sections. It was observed that aspirate films were more sensitive than trephine biopsy sections for the detection of haemosiderin and also provided a more accurate reflection of bone marrow iron stores as the biopsy specimens were decalcified in formic acid. Stuart-Smith et al (15) also observed that the aspirate films were more sensitive than trephine biopsy sections for the detection of haemosiderin and assessment of bone marrow iron stores, because decalcification led to an unquantifiable loss of iron.

References