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A Study of Bone marrow aspiration and biopsy in various haematological disorders

Pathology

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ABSTRACT

Background : Bone marrow examination is an important diagnostic procedure to evaluate both neoplastic and non-neoplastic haematological diseases. The aim of the present study was to correlate bone marrow aspiration and biopsy findings in various haematological disorders.

Materials and Methods: This was a prospective study of 50 cases from Oct 2003 to March 2006 at JSSMC, Mysore. All the the 50 patients with various haematological disorders were evaluated by bone marrow aspiration and biopsy. The findings and diagnosis on aspirate and biopsy were compared to each other.

Results : Out of 50 cases, 43(86%) cases were diagnosed by aspiration alone, where as 49(98%) by aspiration and biopsy. 7 (14%)cases were dry taps on aspiration which was seen in Acute Leukemia, Lymphoproliferative disorder and Myeloproliferative disorder.

Conclusion: Both aspiration cytology and trephine biopsy complement each other to evaluate haematological disorders. Cellular details are better seen in aspiration whereas cellular architecture is well preserved in biopsy. Bone marrow biopsy is the diagnostic investigation in dry tap cases which occurs when the marrow is fibrotic or densely cellular.

KEYWORDS:

bone marrow aspiration, trephine biopsy, haematological disorders

Introduction:

The technique of bone marrow aspiration(BMA) has been universally accepted and widely used1. Bone marrow biopsy(BMB) is essential for diagnosis of inadequate marrow aspirate, bone marrow fibrosis, granulomatous lesions, myeloproliferative disorders(MPD), myelodysplastic syndromes(MDS), aplastic anemia(AA), metastatic tumor and plasma cell dyscrasias[2-9]. It also serves as most reliable method for assessing marrow cellularity following administration of anti-neoplastic drugs and in assessing status of engraftment following bone marrow transplantation. The aim of the present study was to correlate bone marrow aspiration and biopsy findings in various haematological disorders.

Materials and Methods:

The present study consists of 50 random cases admitted to JSSMC, Mysore as in-patients from October 2003 to March 2006 for the evaluation of various haematological disorders. Complete clinical and haematological findings along with other relevant investigations were recorded. Only the cases in which bone morrow study was done by using BMA and BMB were included in the study. The bone marrow aspiration and biopsy was taken at same site using Jamshidi trephine biopsy needle form posterior superior iliac spine under 2ml of 2% xylocaine as local anaesthesia. 0.2-0.3ml of marrow contents were aspirated, films were made and stained with Leishman's stain. The biopsy was fixed in 10% formalin overnight and decalcified with 6% EDTA for 72hrs. The length of biopsy core ranging from 1-3 cm. After routine processing and paraffin embedding, Haematoxylin and Eosin sections were studied. Special stains like Perls, Periodic acid-Schiff (PAS), Reticulin and myeloperoxidase(MPO) were used wherever necessary.

Results: Of the total 50 cases, 43 were diagnosed on BMA cytology alone with megaloblastic anemia(MA) as commonest diagnosis, followed by erythroid hyperplasia(EH). Rest of the 7 cases were dry tap and diagnosed on BMB, the commonest being MPD. Diagnosis on BMA and BMB are shown in Table 1&2. A total of 49 cases was diagnosed in biopsy, with MA being commonest. The overall diagnostic accuracy of BMA in diagnosing haematological disorders was 86% and diagnostic accuracy of BMB was 98%. Bone marrow aspiration diagnosed all 4(100%) cases of multiple myeloma(MM), most of the cases of leukemia 2/4(50%), and Lymphoproliferative disorder(LPD) 2/3(66.66%). Bone marrow biopsy provided diagnosis in above cases. Out of 7 cases of dry tap, biopsy provided the diagnosis in 06 cases(Table 3). In 1 case of dry tap, the biopsy revealed only fibrosis. The study had 33(66%) males and 17(34%) females, with maximum number of cases in 2nd and 3rd decades.

Table-1: Diagnosis on Bone marrow Aspiration (BMA)

BMA diagnosis	No of cases	Percentage of cases
EH	08	18.6%
Micronormoblastic anemia	05	11.6%
MA	15	35.0%
AA	02	4.7%
Immune thrombocytopenia(ITP)	02	4.7%
Acute Myeloid Leukemia(AML)	01	2.3%
Acute Lymphoid Leukemia(ALL)	01	2.3%
Chronic Myeloid Leukemia(CML)	01	2.3%
Chronic Lymphoid Leukemia(CLL)	01	2.3%
Lymphoma	01	2.3%
MM	04	9.3%
Myelodysplastic syndrome(MDS)	01	2.3%
Normal marrow	01	2.3%
Total Cases	43	100%

Table 2 : Histopathological diagnosis of lesions based on trephine biopsy

Histopathological diagnosis	No of cases	Percentage of cases
Micronormoblastic anemia	08	16.3%
MA	20	40.9%
AA	02	4.1%
ITP	02	4.1%
AML	02	4.1%

ALL	02	4.1%
CML	01	2.0%
CLL	01	2.0%
Lymphoma	02	4.1%
MM	04	8.2%
MDS	01	2.0%
MF	03	6.1%
Normal marrow	01	2.0%
Total cases	**49**	**100%**

Table-3: Distribution of Dry Taps in various Haematological Disorders

Disorders	Number of cases	Percentage
AML	1/2	50%
ALL	1/2	50%
LPD	1/3	33.32%
MF	3/3	100%

Discussion:

Sabharwal BD et al[10] stated that core needle biopsy of bone marrow is a valuable diagnostic aid for measurement of marrow cellularity, metastatic tumors and fibrosis. Ideally the bone marrow core biopsy should be reviewed with the knowledge of clinical history, complete blood counts, peripheral blood picture and bone marrow aspirate smears. In a study conducted by Navone R Colombano MT[11], 3173 cases underwent bone marrow biopsies with 138(4.3%) cases being dry tap on aspiration. In the present study, 50 cases underwent bone marrow aspiration and biopsy with 7(14%) cases being dry tap.

In the present study, aspiration alone was diagnostic in 43(86%) cases and trephine biopsy alone was diagnostic in 7(14%) cases where aspiration mainly was a dry tap. It correlated with the study of Marwaha et al[12] which was 372(88.6%) and 48(11.4%) respectively.

The present study observed that diagnostic accuracy(DA) of BMB was higher 98% in comparison of BMA 86% in diagnosing various haematological disorders, which correlates with Smita Chandra who has given DA of BMA as 77.5% and that of biopsy as 99.2%[13]. The commonest haematological disorder diagnosed by BMA in the present study was anemias 30(61.22%) cases. Megaloblastic anemia was the commonest with 20(40.81%) cases, which was similar to the study done by Gayathri et al[14]. EH was seen in 8(18.6%) cases in our study. Various studies showed similar incidence of 14%, 19.6%[15,16] . Those cases diagnosed as EH on BMA in our study was further diagnosed on trephine biopsy as micronormoblastic anemia in 3 cases and 5 cases of MA. Micronormoblastic anemia was diagnosed in 5(11.6%) cases on BMA alone in our study, accounting to total of 8(16.3%) cases. In a study by Ahmad[17], 8% cases were microcytic anemia and diagnosed as iron deficiency anemia.

Bone marrow biopsy was complementary to aspiration for most of the cases in our study. Aspiration is useful in making out better individual cell morphology whereas biopsy is useful in bone marrow architecture pattern and distribution[18]. Daniel NM[19] reported 74% of patients of AA with hypocellular marrow. Biopsy helped us to diagnose AA by assessing cellularity and ruling out other causes of hypocellular marrow.

In the present study of 4 cases of leukemia 2 cases were diagnosed on aspiration and two were dry taps. Trephine biopsy provides additional useful information in AL[20]. The marrow cellularity, degree of fibrosis, extent of marrow replacement and quality of residual hematopoiesis are easier to assess in sections than in smears[21]. Of the 3 cases of LPD, one was a dry tap. Trephine biopsy specimens are an integral part of the diagnosis, staging and follow-up of patients with LPD[22]. Gray et al[23] reported that cases with diffuse marrow infiltration had a poor prognosis as compared with non-diffuse pattern. In the present study, marrow had diffuse infiltration. MF has been reported to be an ominous sign in CML and an immediate precursor of blast crisis[24]. No fibrosis was seen in our study of CML case. In the present study, dry tap was seen in all(100%) cases of MF. Trephine biopsy showed fibrosis with decreased cellularity. In Reticulin stained sections 1(33.3%) was categorised as fibrotic phase, while 2(66.66%) patients belonged to the cellular phase of MF which was similar to the study by Sitalakshmi et al.

Trephine biopsy is helpful to detect aggregates of immature myeloid precursor cells in MDS. In the present study no immature cells were seen. 4cases of multiple myeloma were diagnosed on aspiration and biopsy. Dry tap with marrow aspiration were due to fibrosis and hypercellularity. The frequent diseases diagnosed on bone marrow biopsy in cases where aspiration yielded dry tap were metastatic cancers, chronic myeloid leukemia, idiopathic MF and AA. Hence, the finding of a dry tap should never be dismissed as being due to faulty technique and always needs a biopsy[11]. One case could not be diagnosed on biopsy due to fibrosis.

Conclusion:

Bone marrow biopsy is a safe, easy procedure with very less patient discomfort and is cost-effective. Bone marrow biopsy is the diagnostic investigation in dry tap cases like AA, MF, MDS and metastatic tumors. It helps in monitoring patients with leukemias. Cellular details are better seen in aspiration whereas cellular architecture is well preserved in biopsy. The advantages in correct diagnosis of a case by bone marrow biopsy in conjunction with clinical, haematological and aspiration study, far outweighs the minor disadvantages with biopsy.

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