Research Paper

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Bone Marrow Trephine Biopsy in Hematological Disorders

Medical Science

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ABSTRACT

Examination of the structure and cellular composition of bone marrow is essential for diagnostic purposes in wide variety of disorders affecting the hematopoietic system.1 The aims of study were diagnosis of hematological disorders, for staging of hematological malignancy and to compare bone marrow trephine biopsy with that of bone marrow aspiration. Total sixty bone marrow trephine biopsy of patients with haematological disordes were done. In present study common etiology are acute leukemia (36.6%), chronic leukemia (21.6%) and anaemia (20%). The use of biopsy avoids misinterpretation of cellularity by smears in 40% of patients in whom biopsy confirmed a normocellular, hypocellular or hypercellular marrow. In present study chronic lymphocytic leukemia(CLL) had 7 cases out of 13 cases of chronic leukemia out of which 2 cases(28.5%) had pattern of bone marrow involvement was of diffuse type. Bone marrow biopsy is superior than aspiration for the assessment of cellularity and diagnosis of certain haematological conditions mostly Hypoplastic/ Aplastic marrow, Myelofibrosis, Leukemia and marrow involvement by Lymphomatous infiltration. Trephine biopsy is essential for diagnosis when a 'dry tap'or ' blood tap' occurs as consequences of the marrow being fibrotic or very densely cellular.

Introduction

Examination of the structure and cellular composition of bone marrow is essential for diagnostic purposes in wide variety of disorders affecting the hematopoietic system.[1] 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.[2] The uses and advantages of needle biopsies are numerous. Metastatic deposits, degree of cellularity, fibrosis and assessment of dry taps can readily be determined.[3,4] The bone marrow trephine biopsies are of diagnostic and prognostic value in management of haematological disorders.[5] In present study of ' bone marrow trephine biopsy in haematological disorders' variety of haematological disorders were encountered and trephine biopsy proved helpful in diagnostic hematology, hematoloncology and even in management and prognosis of patients.

Material and Method

This study has been conducted at the Post Graduate Department of Pathology, B.J. medical College and civil Hospital, Ahmedabad, Gujarat. The study was conducted from October 2005 to November 2007.Total sixty bone marrow trephine biopsy of patients with haematological disorders were done and detail history along with systemic, general and local examination, routine haematological investigations and Bone marrow aspiration were taken. The standard technique was employed in obtaining the samples from posterior iliac crest using a Jamshidi needle. For preparing the aspirate particle smears, aspirate was obtained into a syringe and delivered onto clean glass slides and smears prepared. The cores were then fixed in 10 % formalin for 12 to 14 hours then decalcified in HNO_3 for about 30-40 minutes. Then wash in running water and then process over night in automatic tissue processor and blocks were prepared and 3-4 um thin section made. Sections were stained by hematoxyline & eosin stain and by reticulin stain (as when required). After staining and mounting, sections were examined systematically at scanner(x 4x), low power (x 10x), high power (x 40x) and at oil immersion objective (x 100x).

Observation and Discussion

Table 1 Age wise distribution

Age(year)	No. of patients	Percentage(%)
0-10	12	20
11-20	12	20
21-30	11	18.33
31-40	03	5
41-50	07	11.66
51-60	09	15
>60	06	10
Total	60	100

In present study, maximum number of the patients were in the first and second decades(40%), while 10% patients were above 60 years of age. Only 3 patients were between 31-40 years of age group.

Table 2 Sex distribution

Gender	No. of patients	Percentage(%)
Male	39	65
Female	21	35

In present study males was affected more than females with the ratio of 1.85:1.

Table 3 Distribution of haematological disorders

Type of disease	Total no of cases	Percentage(%)
Anaemia	12	20
Acute leukemia	22	36.6
Chronic leukemia	13	21.6
Multiple myeloma	06	10
MDS	02	3.3

Myelofibrosis	01	1.6
NHL	03	5
Hodgkin's disease	01	1.6
Total	60	100

In present study acute leukemia 36.6%(22) is most common followed by chronic leukemia 21.6%(13) and anaemia 20%(12).

Percentage of anemia(20%) in present study is almost similar to that of in Shabharwal et al study[2] (07%) & Delacretaz F et al study[6] (10%). Cases of leukemia (58.3%) is high in present study compare to that in Sabharwal BD et al (10%) and decretaz et al study (14%). This may be due to igh incidence of dry tap and blood mixed marrow- indication of bone marrow trephine biopsy, in cases of leukemia. Cases of myelofibrosis (1.6%) in present study is similar to that in Delacretaz F et al study (1%) cases of MDS in present study (3.33%) is nearest to that of in Sabharwal et al study(10%). Cases of multiple myeloma in present study in 10% cases, while in Sabharwaal BD et al it was 3%.

Table 4 Distribution of non malignant and malignant haematological disorders

Type of disease	No. of cases (%)
Non malignant	15(25%)
Malignant	45 (75%)

Majority of the patients (75%) had malignant haematological disorders (leukemia, myeloma, lymphoma), while only 25%(15) patients had non malignant disorders(anemia, MDS, myelofibrosis).

Table 5 Assessment of cellularity

Cellularity	Normocellular	Hypocellular	Hypercellular	Dry tap	Blood mixed
Trephine biopsy	01	09	50	00	00
Aspiration	05	05	30	12	08

Number of cases of dry tap and blood mixed marrow on aspiration which causes difficulty in evaluation of marrow was quite high (33.4%) cases, which may be due to technical defects or fibrosis of marrow or very hyper cellular marrow. In those cases trephine biopsy proves to be diagnostic.

The use of biopsy avoids misinterpretation of cellularity by smears in 40% of patients in whom biopsy confirmed a normocellular, hypocellular or hypercellular marrow.

Table 6 Comparison of dry tap aspiration

	Aspiration	Bone marrow biopsy	
	Dry tap	Normal marrow	Abnormal marrow
Total 60 cases	20%	00%	100%

In present study dry tap on aspiration in 12 cases(20%), out of which 100% marrow are abnormal on bone marrow trephine biopsy and no cases with normal histology. None of dry tape cases showed normal bone marrow by trephine biopsy in Navone et al study[7], but in Engeste et al study[8] 'dry tap' was in 7% cases with 23% out of them were normal on trephine biopsy and 77% were abnormal.

It is concluded that the finding of 'dry tap' should never be dismissed as being due to faulty technique and always needs a bone marrow biopsy. So 'dry tap' can be considered as "definite" indication for bone marrow trephine biopsy.

Table 7 Pattern of marrow involvement in CLL

Pattern	Diffuse	Non diffuse
CLL(n=7)	28.57%	71.43%

Although bone marrow biopsy is not required for diagnosis of CLL, they can localize a major site of disease and also pattern of bone marrow involvement which is important predictor of prognosis.

In present study 7 cases were of CLL out of total 60 cases. in 2 cases(28.5%)pattern of bone marrow involvement was of diffuse type as compare to Francesca RM et al study[9], in which it was 25 %, in Stefano M et al study[10] it was 9.8 % and in geisler et al study[11] it was 6 %. while other show non diffuse pattern on trephine biopsy, while aspiration only showed that marrow is involved.

Reticulin pattern of marrow is assessed only by trephine biopsy sections and with help of reticulin stain.

Table 8 Bauermeister grading of bonemarrow reticulin and collagen[12]

Grade	Reticulin fiber
0	No reticulin fiber demonstrable
1	Occasional fine individual fibers and foci of a fine fiber network
2	Fine fiber network through out most of the section, no coarse fibers
3	Diffuse fiber network with scattered thick coarse fiber but no mature collagen
4	Diffuse often coarse fiber network with areas of collagenisation

Out of sixty patients one patients of myelofibrosis shows grade 4 reticulin fiber, while those with leukemia had grade 1 to 3 reticulin fiber, while those with anemia doesn't have any demonstrable reticulin fiber(grade 0).

Table 9 diagnostic utility of trephine biopsy

Study	Aspiration	Trephine biopsy
Nanda et al study[13]	88%	12%
Varma et al study[14]	64%	36%
Present study	66.6%	33.4%

As per above table, aspiration alone is sufficient in making diagnosis in 66.6 % cases in present study in these cases trephine biopsy give additional information like marrow fibrosis and assessment of marrow cellularity or pattern of bone marrow involvement by malignant cells and it correlate well with the diagnosis made on aspiration. In the remaining 33.4 % cases trephine biopsy was necessary for making a diagnosis due to incomplete information provided by aspiration. These were mostly hypoplastic/ aplastic marrow, myelofibrosis, leukemia and marrow involvement by lymphomatous infiltration.

In present study diagnostic utility of trephine biopsy in 33.4% cases, as compare to nanda et al study, in which it was 12% and Varma N et al study in which it was 36 %.

Conclusion :

Bone marrow trephine biopsy is superior for the assessment of cellularity than bone marrow aspiration. Trephine biopsy is essential for diagnosis when a 'dry tap' or ' blood tap' occurs as consequences of the marrow being fibrotic or very densely cellular, so finding of a 'dry tap ' should never be dismissed as

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being due to faulty technique and always needs a bone marrow biopsy. Assessment of reticulin, collagen, fibrosis, and pattern of infiltration of marrow can only be done by marrow trephine biopsy section.

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