The diagnostic utility of bone marrow trephine biopsies, at the University of Maiduguri Teaching Hospital: an eleven years retrospective review

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Abstract— Bone marrow aspirations and biopsies are indispensable diagnostic tool in the evaluation of various haematological disorders, non-haematological malignancies and patient follow-up in the 21st century, however, this investigation is sub optimally utilized in most centres.
The study design is cross sectional eleven years retrospective review of trephine biopsies from achived records (2003-2013) at the University of Maiduguri Teaching Hospital.
One hundred and four cases have been recorded and highest rate of biopsies of 26% in 2011 was observed with lowest rate of 1.9% in 2004. Only 8.6% of cases were reported as inadequate. The common age group that was biopsied is 51 years and above accounting for 32.7% with male preponderance.
Trephine biopsies are underutilized in this environment, looking at advances in molecular haematological diagnosis in this era. There is the need to optimize referral system especially in non- haematological diseases in the tertiary health centres.

Key words-.Trephine biopsy, Utility, Maiduguri.

INTRODUCTION

Trepanning of bone is the oldest known procedure carried out by man and yet it is only in the last 100 years that the technique was used to diagnose and treat haematological disorders.[1] Skulls 8000-10000 years old showing evidence of medical intervention have been found in Europe, Northern Africa, Asia, New Guinea, Tahiti and New Zealand this indicates that trephine biopsy was the ancient known procedure carried out on mankind, older then bone marrow aspiration (BMA). [1]Bone marrow examination is an indispensable diagnostic tool in the evaluation of various haematological disorders, non haematological malignancies, pyrexia of unknown origin and infective diseases. [2] It is also valuable for follow up of patients undergoing chemotherapy and bone marrow transplantation. [2] Involvement of marrow by metastases has a significant impact on patient management and prognosis. The procedure serves to establish or confirm a primary diagnosis of lymphoma or to determine the extent of disease dissemination for staging purposes. Trephine biopsy adequacy was provided by demonstrating the likelihood of detecting a metastatic tumour which increases as the length of interpretable biopsy specimen increase from 0.04 mm to > 2 cm, but there was little further gain above a length of 1.2 cm; [3] biopsy specimens of > 2 cm contained tumour in 30% of cases in comparison with biopsy specimens of 0.8–1.2 cm, 26% of which contained tumour. Measurements given relate to a biopsy specimen that has been paraffin wax embedded and decalcified because biopsy specimens shrink by about 25% during processing. [3] In another study comparing imprints, aspirate and biopsy in non haematological disorders it was found that touch imprints gave better assessment of metastatic deposits than aspiration smears in 6 out of the 8 cases studied and provided diagnosis earlier than trephine biopsy. [4] That study showed that aspirate films were more sensitive than trephine biopsy sections for the detection of haemosiderin when the biopsy specimens were decalcified in formic acid. They also provided a more accurate reflection of bone marrow iron stores, because decalcification led to an unquantifiable loss of iron. [4]

The accepted indications for performing a trephine biopsy includes; inadequate or failed aspirate, need for accurate assessment of cellularity, whether increased or decreased, suspected focal lesion, (granulomatous disease or lymphoma), suspected bone marrow fibrosis, need to study bone marrow architecture, need to study bone structure or bone marrow blood vessels.[5] In general, taking bone marrow biopsy alongside aspirate is the most prefered practice and more so patient may benefit from both.

The technical challenges and diagnostic complexity of bone marrow trephine biopsy specimens (BMT) are insufficiently appreciated.[6] Avoiding errors in the histological interpretation of bone marrow trephine biopsy specimens requires an unprecedented degree of collaboration between histopathologists, haematologists, specimen requesters, specimen takers, laboratory technical staff and other scientific staff. It should be noted that specimen of good quality, with full, relevant clinical information is the essential starting point. [3] Sources of error in interpreting BMT histology includes; [7],[8] inadequate clinical information, indequate haematological (blood and aspirate findings), genetic and radiological information. Others are inadequate specimen, too small or too crushed samples, poorly decalcifying/processing, inadequate sections (thickness, number of levels), inadequate stains and or poor staining, insufficient experience to avoid common pitfalls, insufficient confidence to avoid concluding 'consistent with invisible' pathology; that is pathology sometimes represented by the absence of features that should normally be present and forgetting to look at the bone trabeculae and stroma.[3],[9] The trephine biopsy is invaluable in cases where the aspirate fails or is a dry tap as in the case of myelofibrosis, focal marrow involvement as in granulomatous lesions, metastatic tumour and lymphomas. [10] The advantage of both the procedures done together enabled the study cellular cytomorphology along with the pattern of distribution of the cells depending on the cases, hence help in making the diagnosis accurately. [11],[12] In this study we depict eleven years utility of trephine biopsy alongside the corresponding histological diagnosis and it appears that there is suboptimal utility of trephine biopsy as a diagnostic tool in this environment, probably due to poor referral system or inadequate man power and basic equipment to carryout out the procedure.

Methodology: The study design is a cross sectional, eleven years (2003-2013) retrospective review of trephine biopsies from achived records at the Histopathology Department, University of Maiduguri Teaching Hospital. Patient biodata along with the corresponding diagnosis was obtained and the result analysed using SPSS version 17. A correlation between age, sex and histological diagnosis and biopsies done annually was then depicted in tables.

Discussion

One hundred and four trephine biopsies have been recorded in eleven years period (2003-2013) with 27(26.0%) cases as the highest number of biopsies done in 2011 and the less was in 2004 with only 2 (1.9%) cases done. Generally there is sub optimal utility of trephine biopsy examination as an investigation tools in this region. Comparatively, in a study done at the tertiary health centre in Ghana [13] 250 patients were referred to haematology by clinician between 1988 to 1998 requesting for trephine biopsy, excluding primary haemalogical patients that come to clinics, all of the referred cases had trephine biopsy done. In another study [8] 19,259 trephine biopsies were done within 12 months period in UK (1st January to 31 December, 2003) from 63 hospitals amounting to 13,147 combined procedure and 6,112 aspirates. The reason for low utility from this study is probably there were few referral cases to haematology unit in our centre as shown in table 4; most of the diagnosis reflects primary haematological diseases. Only two cases of metastatic carcinoma, one case each of metastatic retinoblastoma and one squamous cell carcinoma and one case of glycogen storage disease were referred cases. The age group commonly biopsy was 51years and above accounting for 34(32.7%) with male to female ratio that were biopsy of 7:3 (table 3). Fifty three (50%) diagnosed cases were reported as essentially normal (table 4). Only 9 cases (8.6%) are reported as inadequate that means that the technique deploy in taking the biopsy was favourable. The highest positive cases that were diagnosed are aplastic anaemia and multiple myeloma with 4(3.8%) cases each (table 4). Fibrosis and metastatic carcinoma accounting for 2.0% each, was also observed. In a study by Surbhi G, et al [2] concordance rates were calculated between BMA and trephine biopsy. In 28.2% cases aspirate was non-diagnostic,

with an overall sensitivity of 71.8%. Jamshidi and Swain reported that in 14-16% patients, aspirate was non diagnostic. However, it has been found that bone marrow aspirate to be 100% specific in most of the disorders, but sensitivity and accuracy depend upon the disease being evaluated. [2]

Conclusion: Trepanning is a valuable diagnostic tool to be use in developing country of ours in the 21st century. There should be adequate referral system that will optimize trephine biopsy utilization where indicated in all tertiary health care centres.

RESULTS:

Table 1

ANNUAL DISTRIBUTION OF TREPHINE BIOPSIES

YEARS	Frequency	Percent
2003	3	2.9%
2004	2	1.9%
2005	6	5.8%
2006	15	14.4%
2007	14	13.5%
2008	5	4.8%
2009	8	7.7%
2010	14	13.5%
2011	27	26.0%
2012	3	2.9%
2013	7	6.6%
Total	104	100.0%

Table 2:
Age group distribution of trephine biopsy

ageGroup	Frequency	Percent
1-10yrs	7	6.7%
11-20yrs	16	15.5%
21-30yrs	20	19.2%
31-40yrs	7	6.7%
41-50yrs	20	19.2%
51yrsAbove	34	32.7%
Total	104	100.0%

Table 3:
Sex distribution of trephine biopsy

SEX	Frequency	Percent
FEMALE	34	32.7%
MALE	70	67.3%
Total	104	100.0%

Table 4:

The patterns of histological diagnoses of trephine biopsies done over eleven years period.

Histological diagnosis	Frequency	%
Aplastic anaemia	4	3.8%
Chronic myelofibrosis	1	1.0%
Chronic lymphocytic leukemia with marrow involvement	1	1.0%
Consistent with megaloblastic anaemia	1	1.0%
Consistent with chronic lymphoid leukemia	1	1.0%
Erythroid hyperplasia	2	2.0%
Erythroid megakaryocytic hyperplasia	1	1.0%
Essentially normal marrow	53	50.0 %
Features are suggestive of pancytopenia	1	1.0%
Fibrosis	2	2.0%
Glycogen storage disease	1	1.0%
Hyperplasia, reactive cytopenia	1	1.0%
Hypocellular marrow	3	2.8%
Inadequate	9	8.6%
Leukemia	1	1.0%
Lymphoid neoplasm	1	1.0%
Lymphoid neoplasm with plasmacytoid appearance	1	1.0%

Metastatic carcinoma	2	2.0%
Metastatic retinoblastoma	1	1.0%
Metastatic squamous cell carcinoma	1	1.0%
Multiple myeloma	4	3.8%
Myeloid neoplasm	1	1.0%
Localization of immature precursor (ALIP)	1	1.0%
No evidence of malignancy	1	1.0%
Osteomyelitis with sequestrum formation	1	1.0%
Positive for malignancy (lymphoid deposit)	1	1.0%
Recovery phase	1	1.0%
Severe hyperplasia	1	1.0%
Suggestive of chronic granulocytic leukemia	1	1.0%
Suggestive of Chronic lymphocytic leukemia	1	1.0%
Suggestive of diffuse mixed small and large cell lymphoma	1	1.0%
Suggestive of myelofibrosis	1	1.0%
Suggestive of myeloid leukemia	1	1.0%
Total	104	100.0%

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