Correlation of Bone Marrow Morphology and Immunophenotyping in Acute Leukaemia Patients

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ABSTRACT

Background: Acute leukaemia (AL) is a malignant disorder of the blood that is characterized by blocked or impaired differentiation of haemopoietic stem cells, resulting in abnormal accumulation of immature precursors and suppression of growth and maturation of cells in vivo. Objective: To find out correlation between morphological and immunophenotypic study of bone marrow among acute leukaemia patient. Methods: This is a comparative cross-sectional study of diagnosis of leukaemia by bone marrow study and immunophenotyping from bone marrow sample with bone marrow alone of suspected cases of leukaemia treated in the department of Haematology in Dhaka Medical College Hospital (DMCH) from March 2015 to August 2015. Bone marrow examination and immunophenotyping was done simultaneously but having bone marrow morphology report we have compared with flow report. Results: Out of 50 patients according to Bone marrow study (BMS) 25(50.0%) of the patients had acute myelogenous leukaemia, 24(48.0%) had acute lymphoblastic leukaemia and 1(2.0%) had acute leukaemia. On the other hand, in immunophenotyping 28(56.0%) patients had acute lymphoblastic leukaemia, 20(40.0%) had acute myeloid leukaemia and 2(4.0%) mixed cell immunophenotyping. Discordance of diagnosis was found in 3(6%) cases which were diagnosed as AML in BMS but were ALL in flow and one acute leukaemia &one AML was subsequently diagnosed as mixed cell immunophenotyping. Conclusion: Subjective variation in the accuracy of diagnosis of leukaemia on the basis of bone marrow study alone may occur. Inclusion of immunophenotyping with bone marrow study improves accuracy of leukaemia.

Key words: Leukaemia, bone marrow study, immunophenotyping, correlation.

Introduction

The acute leukaemia (ALs) are a heterogeneous group of neoplasms arising from transformation of hematopoietic stem cells, usually with a retained partial capacity of differentiation. AL is divided into acute myelogenous leukaemia (AML) and acute lymphoblastic leukaemia (ALL). The overall annual incidence of AML is...
The incidence increases with age, with a median of 67 years. It is <1/100,000/year for persons <30 years of age, but it reaches 17/100,000 for persons 75 years of age. The age-adjusted incidence rate of ALL was 1.6 per 100,000 men and women per year in the United States. This number represents approximately 12 percent of all cases of leukaemia. The median age at diagnosis for ALL is 13 years and approximately 61 percent are diagnosed before the age of 20 years. ALL is the most common malignancy diagnosed in patients younger than age 15 years. No nationwide prevalence study has been conducted in our country, however in DMCH number of new AML patient in 2006, 2007, 2008 & 2009 were 49, 83, 97 & 105 respectively. Immunophenotyping is mandatory for diagnosis, management and to see prognosis of acute leukaemia patient. Though immunophenotyping is superior to morphological study but as a developing country most of Bangladeshi people are financially cripple. So, people cannot afford to do such test. If morphological study correlates with immunophenotyping strongly it may be a strong alternative test for those people who are unable to perform immunophenotyping.

Methods

This is a cross-sectional comparative study of initial bone marrow reports with final complete panel of immunophenotyping reports of clinically suspected 50 acute leukaemia cases treated in the department of Haematology of DMCH from March 2015 to August 2015. Samples were selected.

Results

Total 50 clinically suspected leukaemia patients were included in this study. Out of these 50 patients according to bone marrow study (BMS) 25(50.0%) had acute myelogenous leukaemia, 24(48.0%) had acute lymphoblastic leukaemia and 1(2.0%) had acute leukaemia. On the other hand, in immunophenotyping 28(56.0%) patients had acute lymphoblastic leukaemia, 20(40.0%) had acute myelogenous leukaemia and 2(4.0%) mixed cell immunophenotyping. Interrater reliability is a measure used to examine the agreement between immunophenotyping and BMS investigations. The results of the inter-rater analysis are Kappa: 0.778 with p<0.001. This measure of agreement, while statistically significant, is substantial agreement between immunophenotyping and BMS.

Discussion

This observational study was carried out with an aim to find out correlation between morphological and immunophenotypic study of bone marrow among acute leukaemia patient. According to bone marrow study (BMS) it was observed that a half (50.0%) of the patients had acute myeloid leukaemia, 48.0% had acute lymphoblastic leukaemia and 2.0% had acute leukaemia. According to immunophenotyping in this present study it was observed that 56.0% patients had acute lymphoblastic leukaemia, 40.0% had acute myelogenous leukaemia and 4.0% mixed cell immunophenotyping. According to Hur et al. Immunophenotypic analysis at relapse showed 51.5% had ALL, which is consistent with the current study. In this series it was observed that immunophenotyping ALL was found in 28 cases among them 23(82.1%) in BMS ALL and 5(17.9%) in BMS AML. Immunophenotyping AML was found 20 cases among them all cases were BMS AML. Immunophenotyping mixed cell was 2 cases among them 1 (50.0%) was BMS ALL and 1(50.0%) was BMS AL. Interrater reliability is a measure used to examine the agreement between two lab investigations. It is an important measure in determining how well an implementation of immunophenotyping agreement with BMS. The results of the inter-rater analysis are Kappa: 0.778 with p<0.001. This measure of agreement is statistically significant, which implies substantial agreement between immunophenotyping and BMS.

Conclusion

The accurate diagnosis of leukaemia is essential for the optimization of appropriate treatment. Immunophenotyping is a standard test for diagnosis of leukaemia. But in a developing country like Bangladesh where significant

### Table 1 Correlation between BMS and immunophenotyping (n:50)

| Immunophenotyping | Bone Marrow Study |
|---|---|---|---|---|
| | ALL | AML | AL | P-value |
| ALL (n:28) | 23 | 82.1 | 5 | 17.9 | 0 | 0.0 |
| AML (n:20) | 0 | 0.0 | 20 | 100.0 | 0 | 0.0 | 0.001s |
| Mixed cell (n:2) | 1 | 50.0 | 0 | 0.0 | 1 | 50.0 |

ALL: Acute lymphoblastic leukaemia; AML: Acute myelogenous leukaemia; s: significant measures of agreement Kappa Value 0.774, p value <0.001
A number of people are financially constrained bone marrow morphology can be a strong alternative.

Reference


