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BONE MARROW MORPHOLOGICAL CHANGES IN TREATED CASES OF ACUTE LYMPHOBLASTIC LEUKEMIA – THREE YEAR STUDY

Pathology

Dr. Poonam Nanwani* MD Assistant Professor, Department of pathology, MGM Medical College, Indore *Corresponding Author

Dr. Sativan Khatri MBBS Demonstrator Department of pathology, MGM Medical College, Indore

ABSTRACT

Aims: To study morphological changes in bone marrow in treated cases of Acute Lymphoblastic Leukemia.

Method and material - Prospective study, carried out in Department of Pathology from January 2016 to December 2018. A total of 80 cases were studied. Bone marrow aspiration done and smears were studied in all the treated cases of acute lymphoblastic leukemia.

Result – bone marrow revealed hypocellular marrow in 70 % cases, Normocellular marrow in 26% cases, 4% show Hypercelluar marrow. Dyserythropoiesis and dysmegakaryopoiesis noted in 07 (8.75%) treated cases. Only 04% cases show increased % of blast (residual disease) after completion of treatment.

Conclusion – A bone marrow aspiration after completion of treatment provides information whether patient has achieved remission or still has residual leukemia. It also helps in assessing dysplastic changes in all three cell line due to treatment.

KEYWORDS

acute lymphoblastic leukemia (ALL), dyserythropoiesis, dysmegakaryopoiesis

INTRODUCTION –

Acute lymphoblastic leukemia is most common leukemia of childhood. Leukemia (>95% of which are acute leukemia) constitute the most common diagnostic group of childhood cancers worldwide, and in India.[1,2] Remarkable progress has been made in the treatment of acute lymphoblastic leukemia (ALL, which constitute 75–80% of childhood acute leukemia) with 5-year overall survival rate reaching 90% in the high-income countries (HICs).[3]

A bone marrow examination done at the end of chemotherapy provides information whether patient has achieved remission with regeneration of cells or still has Residual Leukemia. If the patient is in remission, maintenance treatment is started and if not more intensive chemotherapy or bone marrow transplantation may be embarked upon.(4-6)

AIMS:

To study morphological changes in bone marrow in treated cases of Acute Lymphoblastic Leukemia.

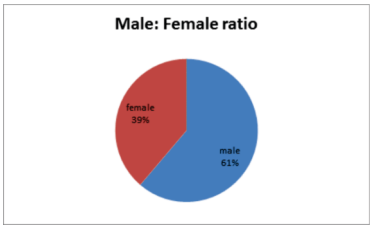
MATERIALS AND METHODS

This prospective study was carried out in department of pathology from January 2016 to December 2018. A total of 80 cases were studied. A record of detailed history and examination of the patient was made. After obtaining informed consent, bone marrow aspiration was done. Bone Marrow Aspiration was evaluated for adequacy, cellularity, morphology and maturation of hemopoeitic precursor cells and for the presence of blast cells.

RESULT –

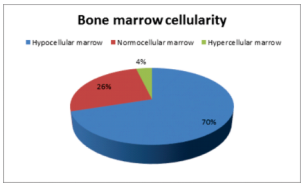
A total of 80 patients received treatment for ALL were included in the study. Majority of cases were of

Age of patients ranged from 1 year to 10 years. Mean age of patients was 6.0 years. There were 31 females, and 49 males. Male: female ration was 1.6:1.(Graph:1)



Graph : 1 male :female ratio

In our study bone marrow revealed hypocellular marrow in 56 cases (70%) (Figure 1), Normocellular marrow in 21 cases (26%), 3 cases (4%) show Hypercelluar marrow. (Graph 2)



Graph : 2 Bone marrow cellularity on bone marrow aspiration

Bone marrow aspiration examination revealed various morphological changes (Table:1), Erythroid hyperplasia was most common bone marrow aspiration finding in treated cases of ALL (Figure 2). Dyserythropoiesis (Figure 3) and dysmegakaryopoiesis (figure 4)were noted in 07 (8.75 %) treated cases (figure 3). Only 4% cases show increased % of blast (residual disease) after completion of treatment. Rest of 96% cases show complete remission after treatment.

Table :1 -Bone Marrow Aspiration study

Bone marrow finding	No. of cases	%
Erythroid hyperplasia with micro erythroblastic maturation	43	53.75%
Erythroid hyperplasia with micro and macro erythroblastic maturation	9	11.25%
Erythroid hyperplasia with megaloblastic change	21	26.25%
Dyserythropoiesis and dysmegakaryopoiesis with erythroid hyperplasia	07	8.75%
Total	80	100%

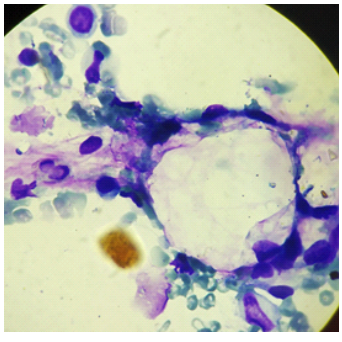


Figure :1 bone marrow aspiration of treated case of ALL showing hypocellular marrow (100 X)

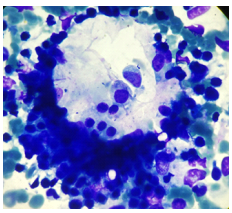


Figure :2 bone marrow aspiration of treated case of ALL showing erythroid hyperplasia with micro erythroblastic maturation (40 X)

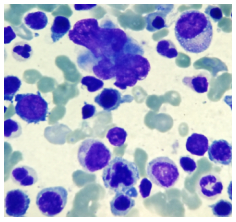


Figure :3 bone marrow aspiration of treated case of ALL showing dyserythropoiesis and dysmegakaryopoiesis (100 X)

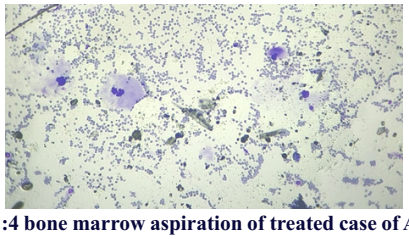


Figure :4 bone marrow aspiration of treated case of ALL showing dysmegakaryopoiesis (10 X)

DISCUSSION-

This study was done to evaluate bone marrow changes in treated cases of acute lymphoblastic leukemia. Among patients enrolled, majority were males and were in age group of 1-10 years with mean age of 6 years. Similarly, Hoelzer *et al.* stated that age is an important but complex risk factor in ALL. Adults and infants with ALL have a poorer prognosis than age group of 2-10 years.(7) Moncke A *et al.* concluded infancy as the most unfavorable outcome and best results were achieved at toddler and preschool age.(8) Alison M. Friedmann *et al.* suggested that the prognostic features in ALL are age at diagnosis; infants (less than one year) and adolescents (greater than nine years), being at higher risk.(9)

Only 4 % cases show persistent of blast after treatment in 96% cases no blast seen in bone marrow smears suggestive of complete remission and good prognosis. Our results are supported by observations of Rautonen *et al.* which indicate that rate of blast clearance can be used as a criteria in identifying subgroup of patient with poor prognosis, as risk of death or relapse is directly proportional to blast clearance.(10) Arnar Gajjar *et al.* supported above findings as persistence of circulating blasts after chemotherapy confers poor prognosis in childhood ALL*(11)*

Morphological changes in bone marrow following treatment is incompletely studied in humans due to complex cell kinetics of bone marrow. Out of 80 cases 70% showed hypocellularity. We observed that after treatment of ALL erythroid hyperplasia is common finding suggestive of erythroid precursor regenerate first compare to myeloid and megakaryocytes after therapy, over study supported by study done by Islam, S *et al which indicate thet* sequence of regeneration at after chemotherapy was erythroid precursors followed by myeloid and megakarocytes.[12] Some interesting findings we observed were dyserythropoeisis and dysmegakaryopoiesis which indicate chemotherapy related bone marrow changes.

CONCLUSION

This study was done to access bone marrow changes in treated cases of ALL. Changes in cellularity and blast percentage indicate response to treatment. A bone marrow examination done at the end of induction chemotherapy provides information whether patient has achieved remission with regeneration of cells or still has residual leukemia. If the patient is in remission, maintenance treatment is started and if not more intensive chemotherapy or bone marrow transplantation may be embarked upon. Dyserythropoiesis and dysmegakaryopoiesis indicate post chemotherapy effect on bone marrow cells.

Footnotes
Source of Support: Nil
Conflict of Interest: None declared.

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