Original Article

Unique characteristics of leukocyte volume, conductivity and scatter in chronic myeloid leukemia

Balan Louis Gaspar [a], Prashant Sharma [a,*], Neelam Varma [a],
Dmitry Sukhachev [b], Ishwar Bihana [a], Shano Naseem [a],
Pankaj Malhotra [c], Subhash Varma [c]

[a] Department of Hematology, Postgraduate Institute of Medical Education and Research, Chandigarh, India
[b] LabTech. Ltd., St. Petersburg, Russian Federation
[c] Department of Internal Medicine (Adult Clinical Hematology Unit), Postgraduate Institute of Medical Education and Research, Chandigarh, India

ARTICLE INFO

ABSTRACT

Background: Modern automated hematology analyzers provide quantitative data on leukocyte size and structure that may be useful to distinguish reactive from neoplastic cellular proliferations. We compared leukocyte volume, conductivity and scatter (VCS) characteristics of chronic myeloid leukemia (CML), bcr-abl1-positive patients with those of non-neoplastic neutrophilia.

Materials and methods: Complete blood counts and VCS data (LH750 hematology analyzers, Beckman Coulter) from 38 newly-diagnosed CML patients, 65 CML on imatinib mesylate therapy, 58 patients with elevated age-specific neutrophil counts due to varied causes, 100 pregnant women and 99 healthy controls were collated and compared. Receiver-operating-characteristic curves, logistic regression models and classification trees were studied for their abilities to distinguish various groups.

Results: Untreated CML had higher mean neutrophil volume and mean monocyte volume (MNV and MMV), mean lymphocyte scatter (MLS) and higher standard deviations of the mean neutrophil volume and conductivity (MNV-SD and MNC-SD) over all other groups ($p < 0.0001$ for all). MNV, MNC-SD and MLS distinguished CML from reactive neutrophilia + pregnancy groups (sensitivities 89.5%, 94.7%, 94.7% and specificities 90.6%, 95.6% and 94.0% respectively). Combination of MNV>163.0 AND MNC-SD>12.69 was 89.5% sensitive and 100% specific for CML. Two algorithmic classification-tree approaches using VCS parameters alone (i.e. without the aid of blood count parameters) correctly separated 100% cases of untreated CML from all others.

Conclusion: Successful distinction of untreated but not post-imatinib CML patients from subjects who were either normal, pregnant or had reactive neutrophilia by automated analyzer-derived cell-population data opens possibilities for their applications in diagnosing and understanding the pathogenesis of CML.

---

* *Corresponding author.* Department of Hematology, Postgraduate Institute of Medical Education and Research, Level 5, Research Block A, Sector 12, Chandigarh 160012, India.
E-mail address: sharma.prashant@pgimer.edu.in (P. Sharma).