Comparison of Novel Expanded Flow Cytometry Assay for Minimal/Measurable Residual Disease (MRD) in B-Lymphoblastic Leukemia (B-ALL) with Gold Standard Assay

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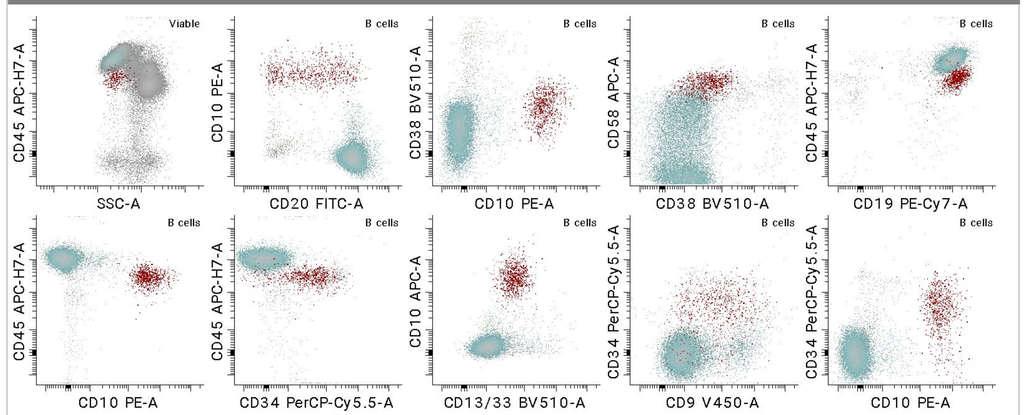
Abstract

B-Lymphoblastic Leukemia (B-ALL) is a malignant hematologic disorder that affects a significant number of both pediatric and adult patients worldwide. Monitoring minimal/measurable residual disease (MRD) in B-ALL patients during and after treatment has proven to be a crucial prognostic indicator, influencing therapy decisions and patient outcomes. Current MRD detection methods, while effective, have limitations in sensitivity and specificity, necessitating the development of more precise and accurate techniques. This project aims to compare a novel expanded flow cytometry assay (FNIH) for MRD detection in B-ALL patients with the existing gold standard assay (COG). The novel assay incorporates advancements in flow cytometry technology, enabling the simultaneous detection of additional B-ALL-specific markers, thus improving sensitivity and accuracy. By evaluating its performance against the gold standard, we seek to determine whether the novel assay can be a reliable alternative for routine MRD assessment.

Materials & Methods

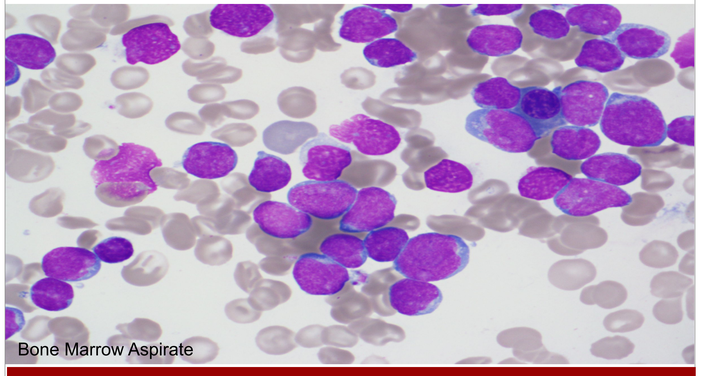
1. **SETUP**
   - A comprehensive search using CoPath's filtration tools was performed to identify a list of cases to study.
   - After identifying cases of MRD in B-ALL with bone marrow aspirate flow cytometry through CoPath, a list containing the specimen number of each report was made using Excel. The initial search included both the expanded flow cytometry assay (FNIH) and the gold standard assay (COG) within the last two years.
   - A separate Excel sheet was created to store the data from the CoPath reports.
2. **DATA COLLECTION**
   - For each B-ALL MRD case filed in the list, the specimen number, patient age, sex, type of flow test, treatment timepoint, percentage of MRD in NMC (COG) and TNC, and expression of several antigens were recorded in a separate data sheet. The antigens recorded include CD9, CD10, CD13+33, CD19, CD20, CD22, CD24, CD34, CD38, CD45, CD58, CD73, CD81, CD123, and CD304. The antigen expressions were either recorded as present, absent, increased, decreased, variable, subset, or uniform.
3. **ANALYSIS**
   - The raw data was maneuvered into an additional Excel sheet to be analyzed. The numbers of the intensity of each marker (present, absent, etc.) for each test were tallied up, and later converted into percentages for the purpose of creating a clustered column graph. Statistics pertaining to the FNIH cases were determined by parsing out and comparing data using Excel, including CD38 to CD81 intensities, the combination of CD10 present/increased and CD73 increased, increased CD123, increased CD304, and decreased CD81.

Results



Conclusions

- **In 176/260 (68%) of FNIH cases, CD38 and CD81 showed similar direction of intensity.**
- **The combination of present/increased CD10 and increased CD73 among FNIH cases occurred 140/260 (54%) of the time.**
- **178/260 FNIH cases (68%) have increased CD73.**
- **73/260 FNIH cases (28%) have increased CD123**
- **144/260 FNIH cases (55%) have increased CD304.**
- **189/260 FNIH cases (73%) have decreased CD81.**



Bone Marrow Aspirate

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References

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Validation of a Novel and Comprehensive Assay for B Lymphoblastic Leukemia Residual Disease Detection by Flow Cytometry. Irani R, Holmes B, O'Gorman M, Roy N, Kovach AE, and Wood BL. Department of Laboratory Medicine and Pathology, Children's Hospital Los Angeles.

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