

A Comparison of STR-PCR and Digital PCR Methods in the Monitoring of Chimerism in a Patient Diagnosed with AML

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Abstract

Objective: STR-PCR is the gold standard for monitoring chimerism following haematopoietic stem cell transplantation. However, it fails to detect mixed and microchimerism due to a sensitivity limit of 1%, as well as technical issues such as stutter peaks and allelic imbalance. Despite these limitations, this study aims to compare STR-PCR with digital PCR (dPCR), which achieves 0.01% sensitivity using high-specificity markers.

Materials and Methods: This study examined chimerism following an allogeneic bone marrow transplant from a TÜRKKÖK donor in a patient diagnosed with acute myeloid leukaemia (AML), using STR-PCR and digital PCR methods. The patient's chimerism status at 1 and 2 months post-transplant was assessed using both methods with the same samples and under the same conditions. Subsequent follow-ups (on days 99 and 227) were performed using dPCR only.

Results: While STR-PCR yielded a 100% donor profile in the first month, dPCR revealed the presence of microchimerism with a donor-to-recipient ratio of 99.04% to 0.96%. In the second month, STR-PCR yielded a donor to recipient ratio of 61% to 39%, while dPCR revealed a ratio of 70.73% to 29.27%. On day 99, the dPCR analysis showed a donor-to-recipient ratio of 11.24% to 88.76% and on day 227, a ratio of 12.58% to 87.42% was observed, which was consistent with clinical relapse.

Discussion: This study demonstrates that STR-PCR is a reliable and informative method for monitoring HSCT chimerism. However, it cannot detect microchimerism at levels below 1%. Using the same samples, the dPCR-INDEL method detected microchimerism and, due to its quantitative accuracy, produced more reliable results than STR. Later analyses (Days 100 and 227) performed exclusively with dPCR captured the relapse process with a high recipient contribution.

Keywords: Acute Myeloid Leukemia (AML), chimerism analysis, dPCR, STR-PCR

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