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Paper Title: Centrifugal Microfluidic Based Painless Blood Sample Collection for Hematocrit Measurement

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Abstract

This work demonstrates a centrifugal microfluidic chip design for painless blood collection and hematocrit measurement. The fluid channel in the microfluidic chip was fabricated using a laser-cutting method. An optimal dimension of the negative pressure chamber was designed to control the maximum sample volume obtained for further hematocrit examination. The estimated blood sample of 20 μl could be obtained based on the negative pressure driven by finger press actuation on the negative pressure chamber of the microfluidic chip. The repeatability of blood volume collation evaluated by a laboratory technician was $21.126 \pm 0.001 \mu\text{l}$ with a coefficient of variation (CV) of 5.32%. The sample volume used in this centrifugal microfluidic chip was around three times lower than that used in the standard method. Pack red cell preparation for hematocrit examination in the microfluidic chip could be achieved using a centrifugation force around 2.4 times lower than that used in the standard method. The hematocrit examination by our centrifugal microfluidic chip and the standard method was 41.75 ± 0.77 (1.84 %CV), and 41.5 ± 0.71 (1.7 %CV), respectively. The results showed that the hematocrit measurements in our centrifugal microfluidic chip were compatible with those measured by the standard method.
