



Prematurity detection by light - R112

An affordable, low-cost and noninvasive multiband reflectance photometric device for reveal Gestational Age at birth

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Introduction

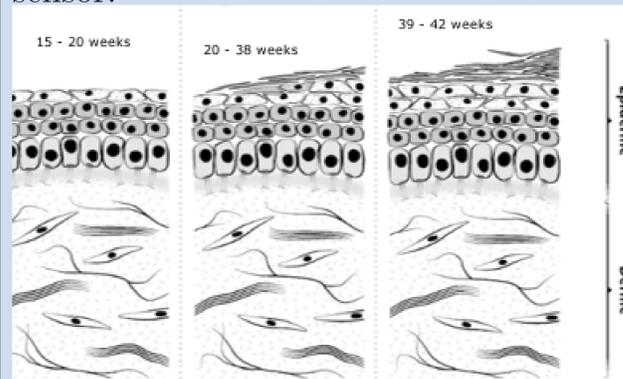
This work was motivated by the desire to develop a low cost device that can immediately estimate the age of a newborn at birth. The most crucial information at birth are gestational age (GA) and weight, without this information the infant viability could be neglected, as well his potential of a healthy life.

Nowadays, the gold standard to determine the GA is the first-trimester ultrasound. However, there is a discrepancy of approximately five to seven days with the last menstrual period, and after that time the precision of the GA information will be even more inaccurate. In addition, the ultrasound is a difficult approach to carrying on in clinical practice and considered inaccessible in low-income settings.

Our solution addresses one answer to a low-cost technology to support a big global health problem: the quality of care at birth and neonatal period, facing the doubt or unknown on the chronology of gestation. Premature newborns are more vulnerable to death during the first days, and following days of life, severe childhood neurological disability, and lifelong complications.

Assumptions

We assume that the strength of the reduced scattering coefficient, μ , will influence the amount of light reflected by the neonatal skin. Hence, a first quick approximate score for the GA of the neonatal is the maximum value of optical reflectance from the skin. This maximum occurs for light that penetrates deeply into and out of the skin layers. We will then evaluate the scattering of light by skin using light LEDs of different colors, which penetrate at different depths, then being reflected and will finally, reach the sensor.



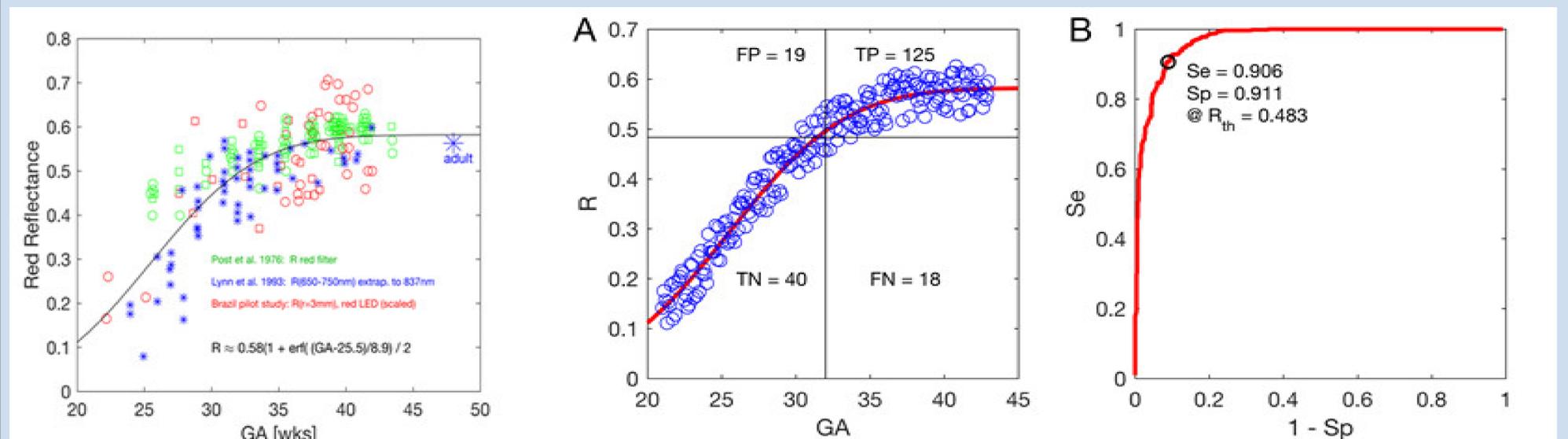
The Reflectometer Device

The sensor module is composed by 6 LEDs of 3 distinct colors, a photodiode, a printed circuit board (PCB) and an optical barrier that surrounds the photodiode. The 6 LEDs have 3 different wavelengths, corresponding to blue, green and red colors in the visible electromagnetic spectrum region. The LED light of the same color are side by side at different distances from the photodiode. We design to the probe a cover, to make it more robust, easily cleanable/disinfectable and with special ergonomics to avoid strong pressure from the operator against the newborn's skin, which would cause a variation in reflectivity measurements.



Results

Preliminary human tests, to estimate the GA, was made in 96 newborns among whom 9 were stillbirth. With a still small number of newborns we validated for comparing our results with previous results found in the literature obtained with more complex and therefore expensive devices (Post et al. 1976 and Lynn et al. 1993).



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