Abstract (600 word limits)

Background: Current technologies to monitor vital signs in newborn infants require adhesive electrodes or sensors to cause pain and damage the fragile skin. The impulse radio ultra-wideband (IR-UWB) radar recognizes motion of an object in a distance, which may also be utilized to monitor vital signs without contact. The purpose of the study is to assess respiratory rate (RR) in neonates using IR-UWB radar and to evaluate its feasibility and accuracy, compared to conventional monitoring (CM) in the neonatal intensive care unit (NICU).

Methods: RR was recorded on day 2 to 6 in 7 newborn infants, 105 recordings of 5-minute time period using both IR-UWB radar with 35 cm away from the chest and CM simultaneously in the NICU. The RR data and the level of movement (M0<1<2) were automatically collected by a software algorithm.

Results: IR-UWB radar was well tolerated and signal quality was good. The radar-derived estimates of RR is significantly correlated to the reference value derived from the CM and showed good agreement by the Bland-Altman plot when the body movement of a neonate was small; $r = 0.83$ and mean difference (limits of agreement) 1.6 [14 to -10] breaths/min during M0 between two methods, $r = 0.66$ and -2.5 [14 to -19] breaths/min during M1, $r = 0.60$ and -6.2 [9.8 to -22] breaths/min during M2, respectively.

Conclusion: We demonstrated that it is possible to monitor RR using IR-UWB radar in newborn infants, with an accuracy which is clinically useful. To the best of our knowledge, this is the first study about the feasibility of non-contact monitoring of vital signs in NICU using IR-UWB radar.

Keywords— IR-UWB radar, newborn, non-contact sensor, respiratory rate

Recent Publications (up to 5)

• Ryu H, Han G, Choi J, Park HK, Kim MJ, Ahn DH, Lee HJ (2017) Object permanence and the development of attention capacity in preterm and term infants: an eye-tracking study. Ital J Pediatr. 43:90-98.

• Lee J, Park HK, Kim JH, Choi YY, Lee HJ (2016) Bone Mineral Density According to Dual Energy X-ray Absorptiometry is Associated with Serial Serum Alkaline Phosphatase Level in Extremely Low Birth Weight Infants at Discharge. Pediatr Neonatol 58:251-257.

• Kim DY, Park HK, Kim NS, Hwang SJ, Lee HJ (2016) Neonatal diffusion tensor brain imaging predicts later motor outcome in preterm neonates with white matter abnormalities. Ital J Pediatr 42:104-111.

• Lee HJ, Koh SH, Song KM, Seol IJ, Park HK (2016) The Akt/mTOR/p70S6K Pathway is Involved in the Neuroprotective Effect of EPO on Hypoxic/Ischemic Brain Injury in a Neonatal Rat Model. Neonatology 110:93-100.

• 	Park HK, Choi BS, Lee SJ, Son IA, Seol IJ, Lee HJ (2014) Practical application of kangaroo mother care in preterm infants: clinical characteristics and safety of kangaroo mother care. J Perinatol Med 42:239-245.

Biography (upto 150 words)

Hyun-Kyung Park has completed her PhD at the age of 30 years from Hanyang University, Korea and postdoc fellowship at Harvard University, USA. She is the director/asso. professor of Hanyang University, Korea. She has about 50 publications, and has been serving as an editorial board member of Korean Society of Neonatology.

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References (With Hyperlink)

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