

초음파 도플러 센서 기반 삼킴 모니터링 및 분석 시스템 개발

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Development of an Ultrasonic Doppler Sensor-Based Swallowing Monitoring and Assessment System

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ABSTRACT

Objective: The aim of this study is to develop a swallowing monitoring and assessment system (SMAS) that is noninvasive and quantitative. **Background:** Existing methods for swallowing evaluation using X-ray or endoscopy are intrusive and qualitative. **Method:** The SMAS was developed comprising an ultrasonic Doppler sensor array, a microphone, and an inertial measurement unit to collect ultrasound signals only from swallowing activities. Ultrasound signals were measured for combinations of two types of liquid (water and yogurt) and two different volumes (3 mL and 9 mL) from 24 healthy participants (14 males and 10 females; age = 30.5±7.6 years) and were quantified for 1st peak amplitude, 2nd peak amplitude, peak-to-peak (PP) time interval, duration, energy, and proportion of two or more peaks. **Results:** The peak amplitudes and energy significantly decreased by viscosity of liquid and the PP time interval and duration increased by

volume. The correlation between the time measures were higher ($r = 0.78$) than that of the amplitude measures ($r = 0.30$), and the energy highly correlated with the 1st peak amplitude ($r = 0.86$). The proportion of two or more peaks varied from 76.8% to 87.9% by viscosity of liquid and volume. **Application:** The SMAS would be useful for early detection of swallowing disorder once concurrent validity and generalizability are examined.

Keywords: swallowing; assessment; ultrasonic Doppler sensor; quantification; correlation

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