Sensors and Materials, 4, 6 (1993) 337–349
MYU, Tokyo

S & M 0123

Transducer for Measuring Skin Stiffness

Hisao Oka*, Takashi Irie, Kiyotaka Yasuhara
and Tatsuma Yamamoto

Department of Electrical and Electronic Engineering,
Faculty of Engineering, Okayama University
3-1-1 Tsushima-naka, Okayama 700, Japan

(Received September 3, 1992; accepted March 18, 1993)

Key words: viscoelasticity, biomechanical impedance, stiffness, palpation, resonance frequency

Palpation allows a highly sensitive evaluation of the stiffness of the skin surface. It is, however, difficult to objectively evaluate stiffness by means of palpation. Some measurements of biomechanical properties have been studied. The authors also developed a measurement system which yields biomechanical impedance by applying random vibration on the skin surface. This system was on a large scale because of the use of a personal computer for data analysis. In this study, a transducer and a stiffness meter which measures the skin stiffness have been developed. In the meter, a sinusoidal vibration with a single frequency is applied to the skin surface. The acceleration at the driving point of vibration is detected and the index of stiffness, *SH* (skin hardness), is obtained from the amplitude of acceleration. The meter is characterized by portable size and rapid measurement. We have examined the clinical practicality of the meter using some experimental models, and compared the *SH* with an evaluation by a therapist's palpation.

1. Introduction

The measurement of the biomechanical properties of the skin surface has been anticipated in, for example, clinics, skin sciences, and cosmetics. Such a measurement would also enable quantification of palpation, pressation, and percussion. Obtaining an index of skin stiffness and determining the viscoelasticity of the skin sur-

*To whom correspondence should be addressed