

## Portable Palpation Probe for Diabetic Foot Ulceration Monitoring

**Authors :** Bummo Ahn

**Abstract :** Palpation is widely used to measure soft tissue firmness or stiffness in the living condition in order to apply detection, diagnosis, and treatment of tumors, scar tissue, abnormal muscle tone, or muscle spasticity. Since these methods are subjective and depend on the proficiency level, it is concluded that there are other diagnoses depending on the condition of the experts and the results are not objective. The mechanical property obtained by using the elasticity of the tissue is important to calculate a predictive variable for monitoring abnormal tissues. If the mechanical load such as reaction force on the foot increases in the same region under the same conditions, the mechanical property of the tissue is changed. Therefore, objective diagnosis is possible not only for experts but also for patients using this quantitative information. Furthermore, the portable system also allows non-experts to easily diagnose at home, not in hospitals or institutions. In this paper, we introduce a portable palpation system that can be used to measure the mechanical properties of human tissue, which can be applied to monitor diabetic foot ulceration patients with measuring the mechanical property change of foot tissue. The system was designed to be smaller and portable in comparison with the conventional palpation systems. It consists of the probe, the force sensor, linear actuator, micro control unit, the display module, battery, and housing. Using this system, we performed validation experiments by applying different palpations (3 and 5 mm) to soft tissue (silicone rubber) and measured reaction forces. In addition, we estimated the elastic moduli of the soft tissue against different palpations and compare the estimated elastic moduli that show similar value even if the palpation depths are different.

**Keywords :** palpation probe, portable, diabetic foot ulceration, monitoring, mechanical property

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