

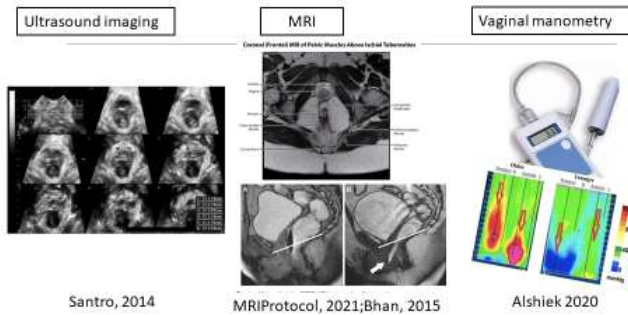
Development of device for measuring the stiffness of pelvic floor muscles: An attempt to develop a device for measuring pelvic floor muscles

Sakamoto A^{a*}, Eguchi T^b, Yamaguchi D^b, Wen Liang Y^b, Gamada K^c, Fukuda O^b

A : Faculty of rehabilitation sciences, Nishikyusyu university, Kanzaki-shi, Saga, Japan b : Department of information science and engineering, Saga University, Saga, Japan c : GLAB Co., Ltd., Higashihiroshima-shi, Hiroshima, Japan

【Introduction】

Dysfunction of the pelvic floor muscles (PFM) contributes to persistent postpartum urine leakage (Yamada,1993; Soave et al., 2019). The head of the fetus during pregnancy presses on the bladder, changing the angle of the bladder suture, the width and depth of the urethra during the effort (Jundt et al., 2010). PFM are damaged by episiotomy and internal pressure due to childbirth (Yamada, 1993). Muscle damage causes adhesions between fascia and slip failure between muscles (Wilke et al., 2019). It is important to appropriately assess the causes of dysfunction of the PFM and select the treatment and exercise therapy that matches the cause. There are several measurements of PFM dysfunction.



【Results】

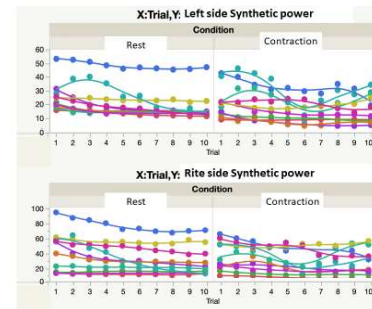


Figure1. Ten trials at resting and contraction

In Reliability, The inter-examiner correlation coefficient of the new measurement showed a high value of 0.61~0.988 ($p < 0.01$) in the results of 10 times each at resting and contraction (Fig1).

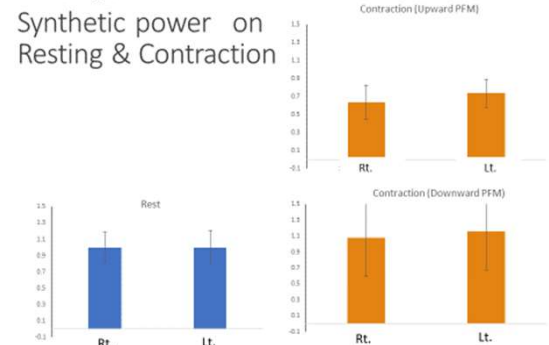


Figure2. Synthetic power of resting & contraction

In Rest, there was no differences between Rt. And Left. In terms of contraction, the power was higher than rest condition in downward PFM and lower than the resting condition in upward PFM (Fig. 2).

【Discussion】

The purpose of this study was to develop a new measuring device that evaluates the dysfunction of the pelvic floor muscles, which is one of the causes of urine leakage, by the difference in muscle elasticity, focusing on the elastic force of the PFM. There was no difference in the synthesis of the left and right pelvic floor muscles at rest. In the group where the PFM were downward on ultrasound images, the synthetic force increased slightly on both the left and right sides compared to rest. This is probably due to increased elasticity of the PFM. In the group where the pelvic floor muscles were upward on ultrasound imaging, elasticity decreased slightly compared to rest because the PFM are rising. In the limitation, regarding the contraction of the PFM, although the contraction practice was performed before measurement, the contraction could not be sustained, and it is possible that the force was lost when the sensor touched the PFM. Since the number of populations is small, it is necessary to increase the number of populations and verify them.

【Conclusion】

The difference in resultant force between resting and contraction can be measured. It is possible to measure the difference between the left and right sides of the resultant force of the PFM at rest and the time of contraction. Thus, the developed measuring system evaluates the elasticity of PFM

【Acknowledgment】

This work was supported by JSPS KAKENHI Grant Numbers JP 20K19160 and JKA and its promotion funds from KEIRIN RACE 2023P-389.

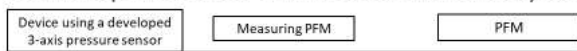
【Contact】

Corresponding Author: Asuka Sakamoto Email: sakamotoas@nisikyu-u.ac.jp

There is no device to evaluate the mechanical characteristics of the function of the PFM, such as the elasticity of the PFM

Aim: To develop a new measurement system based on 3-axis pressure sensors to detect pelvic floor muscles elasticity which the dysfunction of the PFM.

【Methods】 Development of a measurement system



- Measure the reaction force of the pelvic floor muscles to push and the resultant force in the XYZ direction, and compare left and right
- Also, analyze which direction the force increases in the XYZ direction.

Cleated the measurement system Ver.2



Participants: 10 male (Ave age 19.8 ± 0.3)

Evaluation of PFM elasticity at rest and contraction

Measured 10 times each and the resultant force of the peak values of the PFM in three directions was calculated

In order to understand the actual contraction of PFM, the movement of PFM during contraction at rest was measured using an ultrasound imaging system (Viamo, SSA-640A, Toshiba Medical Corporation) and a linear probe (PLT-1204ST, Toshiba Medical Corporation).

The ratio of the right force to the left force was calculated. Based on the results of ultrasound imaging, the PFM groups were divided into groups that moved upward and downward during contraction, and the results of the PFM group measurement device were observed. For statistical analysis, SPSSVer20 (IBM, USA) was used to calculate the Cronbach's coefficient and the intra-class correlation coefficient between examiners.