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The Study of a Diagnostic Algorithm for the Quantitative Evaluation of Stress Urinary Incontinence

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ABSTRACT

Pelvic floor muscle is the main sub-system that maintains urinary continence. The weakness of pelvic floor muscles causes the stress urinary incontinence, and therefore the degree of functioning of pelvic floor muscles could be used as an index to assess the degree of stress urinary incontinence. In this study, the quantitative diagnosis algorithm was proposed to estimate the degree of stress urinary incontinence (SUI) by measuring the contraction pressure of pelvic floor muscle. For these reason, the contraction pressure measurement system from pelvic floor muscle was developed, and the measuring protocol was suggested to analysis the obtained data. As the results of clinical test, the proposed diagnosis algorithm shows the 80% of accuracy, and 20% of false positive diagnosis. On the other hand, false negative results were not confirmed. Consequentially, we thought that the proposed urinary incontinence diagnosis algorithm can quantitatively diagnose the progression of the stress urinary incontinence and it can be used for the development of the incontinence diagnosis system.

Keywords: Pelvic floor muscle, Stress urinary incontinence, Diagnostic algorithm, Diagnostic parameters

I. INTRODUCTION

Stress urinary incontinence is the loss of small amount of urine caused by intravesical pressure due to the sudden increase of abdominal pressure associated with coughing or laughing. It comprises approximately 70~80 % of total urinary incontinence. It commonly occurs in middle-aged women with a history of delivery, and its most common cause is a decrease in urethral resistance caused by the bladder and urethra dropping downwards because of weakness in pelvic floor muscles which have been stretched during delivery.[1-2]

Stamey's clinical classification is currently used as the criteria for classification of stress urinary incontinence: Stress urinary incontinence is classified according to its level of severity. It is classified at one of four levels: Grade 0, Grade 1, Grade 2, and Grade 3. Because the treatment for the stress urinary incontinence is based on its level of severity, the accurate diagnosis of urinary incontinence is very important.[3] The typical diagnostic method for stress urinary incontinence involves both a general examination and an urodynamic test. The general examination includes taking the patient's history, which involves asking about his or her condition; a physical examination that involves checking the extent to which the pelvic floor muscle has dropped, together with neurologic function; and a pad test, that

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involves making a diagnosis by checking the amount of urine excreted.

An urodynamic test diagnoses voiding dysfunction by evaluating the function of the bladder, a functional unit of the lower urinary tract, and the urethra sphincter. Through the execution of a bladder function test, uroflowmetry, and a sphincter function test, it is possible to ascertain, objectively, the physiological function and pathology of the lower urinary tract with an accuracy that is difficult to ascertain from history taking, physical examination, and pad test alone. Moreover, the urodynamic tests are essential for assessing the factors related to the storage and excretion of urine.[4-7]

However, all these tests have disadvantages: Because a general examination relies on a doctor diagnosing a patient's symptoms on the basis of his or her subjective opinion, the diagnosis can vary with each doctor, and there is a real possibility of an incorrect diagnosis being made. The objective evidence available to an examining doctor is generally insufficient to validate his or her opinion. On the other hand, although a more objective diagnosis of urinary incontinence can be made by using an urodynamic test, it is an expensive test and its application takes too long for patient acceptability. Furthermore, with an urodynamic test there is problem with reproducibility, as the diagnosis is based on only one parameter. This means that the diagnosis may be slanted, due to other, undisclosed, health factors. Therefore, in order to make an accurate diagnosis, an urodynamic test needs to be used in conjunction with other tests. For this reason, we are suggesting the use of a diagnostic algorithm which can make a quantitative diagnosis of the progress of stress urinary incontinence by analyzing data obtained through the use of a bio-signal measurement system, which measures the contraction pressure of pelvic floor muscle.

II. MATERIALS AND METHOD

In this study, the bio-signal measurement system that obtains information about the contraction pressure of the pelvic floor muscle was fabricated, in order to put forward a method that presents the degree of stress urinary incontinence quantitatively. The diagnostic parameters were established by analyzing data relating to the contraction pressure of pelvic floor muscle obtained from outpatients of the Department of Urology at Inje University, Pusan Paik Hospital. The significance of the diagnostic parameters was evaluated and the patients with similar characteristics were grouped into each classification group, by using a statistical analysis program (SPSS 12.0). The diagnostic algorithm was proposed by analyzing the characteristics of the diagnostic parameters of each classified group. In order to evaluate the efficacy of the proposed algorithm, the factor analysis, multiple regression, and discriminant analysis were performed.

1. Bio-Signal Measurement System

The bio-signal measurement hardware and a data analysis program was developed in order to measure and analyze the degrees and changes of contraction pressure of pelvic floor muscle. Fig. 1 shows the block diagram of the bio-signal measurement system. The bio-signal measurement hardware consists of a balloon sensor which measures the contraction force of the pelvic floor muscle after insertion into the vagina; a pressure sensor which converts air pressure delivered from the balloon sensor into voltage; and data transmission equipment which sends data to a PC to analyze the contraction pressure of the pelvic floor muscle. The silicon pressure balloon sensor, made by Pathway Co. Ltd, was used for the balloon sensor. This is designed to send inner air pressure to the outside through a tube when the pelvic floor muscle contracts. For the pressure sensor measurement a SM 5812 pressure sensor (Microstructure Co. Ltd) which can measure up to 34.5 kPa, was used (The range of

contraction pressure varies from 5~20 kPa, and the resolution was 8.3476 pa/mV.). For the data transmission equipment a DAQ-Pad USB-6015 (National Instruments Co. Ltd) was used. This can transmit up to 10 samples per second. The data concerning the contraction pressure of the pelvic floor muscle which was transmitted to the PC though the data transmission equipment, was defined as diagnostic parameters by using a data analysis program. This data analysis program consists of the measurement mode that conducts real-time monitoring of data about the contraction pressure of pelvic floor muscle and the analysis mode that analyzes signals and establishes diagnostic parameters. The measurement mode is used to measure contraction pressure of pelvic floor muscle. Through this mode, the changes of pressures can be monitored and saved in real-time. The analysis mode is used to analyze the data about the contraction pressure of pelvic floor muscle (as obtained through the measurement mode), and to establish the diagnostic parameters. The analysis mode shows a graph of all measured pressure and a normalized graph of pressure. In addition, it shows the scores for the diagnostic parameters which were suggested in this study through data analysis.

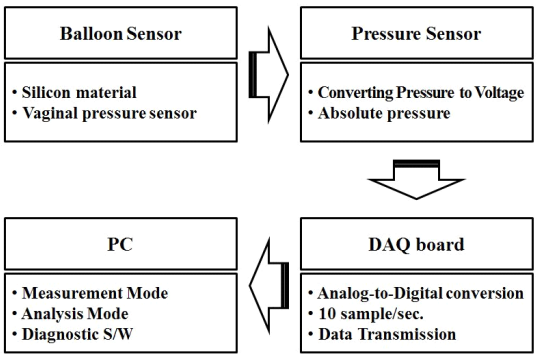

Fig. 1. Block-diagram of bio-signal measurement system.

As parameters, this study suggested that the pelvic floor muscle should be contracted for 5, 10 and 20 seconds respectively, in order to measure the maximum contraction of pelvic floor muscle, pressure reduction rate, duration of maximum pressure, and space area. A rest time of 10 seconds was given between contractions. The data system was designed to obtain data with identical patterns from all patients, through the suggested measurement protocol.

2. Urinary incontinence diagnostic parameters

The profiles of the contraction pressure were obtained by using the bio-signal measurement system and the measurement protocol described. Fig. 2 shows typical pressure graphs for a patient with stress urinary incontinence and for a person who is clinically normal. According to the graph of the clinically normal person, the measurements of maximum pressure at 5, 10 and 20 seconds respectively, were similar, and the contraction could be maintained at its maximum value without reduction of pressure. In comparison, it was found that a patient with stress urinary incontinence could not maintain a contraction of pelvic floor muscle and the contraction decreased immediately after reaching the maximum pressure. In addition, 'wave shaking' was observed while the contraction pressure was decreasing, because the contraction of muscle was unsteady.

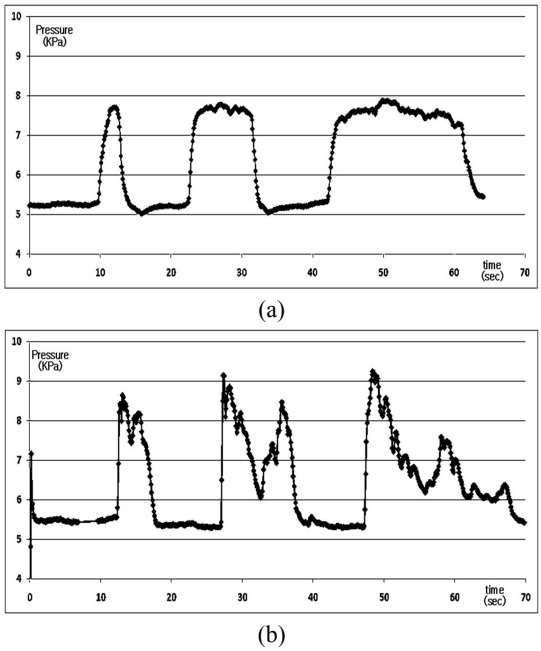

Fig. 2. Pressure graphs showing both normal and SUI cases; (a) normal case (b) SUI case.

In this study, in order to evaluate the condition and the potential strength of pelvic floor muscle, the maximum contraction pressure and the duration of maximum pressure that were proposed in the primarily study were used. Through the comparison and analysis of the graphs, the additional diagnostic parameters such as pressure differences, pressure reduction rate and space area were suggested.[8,9] The maximum contraction pressure indicates the degree of pelvic floor muscle contraction, and the pressure difference indicates the difference between the pressure measured during pelvic floor muscle contraction and the pressure measured between contractions. The pressure reduction rate means the degree of pressure reduction subsequent to the maximum contraction pressure. The duration of maximum pressure means the time for which the maximum contraction pressure is maintained. In addition, the space area indicates the energy required to contract the pelvic floor muscle for 10 seconds. Fig. 3 shows the each diagnostic parameter displayed on a graph showing the contraction pressure of pelvic floor muscle.

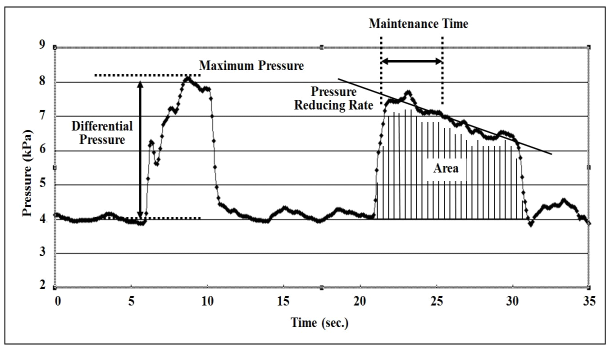

Fig. 3. Diagnostic parameters with the pressure graph.

3. Obtaining and Analyzing Data

In this study, the analysis was planned using 6 subjects who were diagnosed as normal through urinanalysis, bladder ultrasound examination and history taking, and 19 other patients who were diagnosed as suffering from stress urinary incontinence, with a negative history of surgery in relation to urinary incontinence. The mean age of the subjects was 50±15 years, so the range included various age groups. After analyzing the data obtained from the subjects, the following five diagnostic parameters were suggested: maximum contraction pressure, pressure difference, pressure reduction rate, duration of maximum pressure, and space area.

The t-test was performed to ascertain whether the suggested diagnostic parameters were appropriate for classification of both the normal group and the patient group. In order to classify the data showing similar characteristics, the cluster analysis was conducted. In order to build clusters, the hierarchical clustering method was used, which starts with one independent cluster and then builds additional clusters with similar characteristics. The diagnostic algorithm was derived based on the observed characteristics of the diagnostic parameters which were exhibited in each classified cluster. In order to evaluate the efficacy of the algorithm, the factor analysis, multiple-regression, and discriminant analysis on the results were performed. Through the factor analysis, two common factors that could explain the five diagnostic parameters were generated, and obtained a score for each factor. The multiple regression analysis using the two obtained factor scores as dependent variables was conducted. Through the two multiple regression equations which resulted from the multiple regression analysis, the common factor scores of each subject could be estimated. And then the linear discriminant function to assess the degree of urinary incontinence in each subject was derived, based on the two common factor scores established through discriminant the multiple regression analysis. The five groups were classified by using the linear discriminant function.

III. RESULTS AND DISCUSSION

1. Statistical evaluation

Through the multi-variate analysis of variance, the

effectiveness of the suggested five parameters could be confirmed as diagnostic parameters by which to distinguish between the normal group and patient group. The normal group and patient group were classified by using cluster analysis and the further analyses on these two groups were confirmed. Before conducting t-test analysis, we evaluated whether equal variance was assumed by verifying significance probability under Levene's equal variance test. The test result showed that the p-value was more than 0.05 in maximum contraction pressure, pressure difference and space area (maximum contraction pressure: 0.847, pressure difference: 0.214, space area: 0.205). This means that equal variance could be assumed. For the pressure reduction rate and duration of maximum pressure, the p-values were 0.007 and 0.001, respectively. Since these values were less than 0.05, the equal variance could not be assumed for these two parameters. After conducting the t-test, the p-values were shown as follows: maximum contraction pressure (p=0.001), pressure difference (p=0.000), pressure reduction rate (p=0.006), duration of maximum pressure (p=0.001) and space area (p=0.000). As a result, it was confirmed that each diagnostic parameter could be used to distinguish between the normal group and the patient group. Table 1 shows the result of the t-test for each diagnostic parameter.

Table 1. Flow chart for the diagnostic algorithm

		Levene's Test for Equality of Variances		t-test for Equality of Means	
		F	Sig.	t	Sig.
MAX Pressure	EVA*	0.038	0.847	3.839	0.001
	EVNA **			3.847	0.004
Diff. Pressure	EVA*	1.635	0.214	6.260	0.000
	EVNA **			5.435	0.001
Reduce Rate	EVA*	8.885	0.007	-1.742	0.095
	EVNA **			-3.025	0.006
Main. Time	EVA*	13.682	0.001	2.551	0.018
	EVNA **			3.983	0.001
Area	EVA*	1.700	0.205	7.630	0.000
	EVNA **			6.132	0.001

* Equal variances assumed, ** Equal variances not assumed

In this study, the cluster analysis was executed in order to classify the normal group and the patient group and further divide the patient group based on the analysis of the values of the five diagnostic parameters. The hierarchical clustering method was used to build clusters. For calculation of distance between clusters, we used the Ward method. At the first stage of the cluster table, the coefficient indicating the sum of squared Euclidean distance was 0.001 in the case of 23 and 24. Since 0.001 was the smallest number, clusters were formed in the case of around 23 and 24. At the second stage, the coefficient was 0.009 in the case of 18 and 23 and the clusters were therefore formed in these two cases. In all, the clusters were formed in the case of 18, 23 and 24. Throughout this process, the formation of clusters was continued up to the twenty fourth stages. And then all subjects were classified into five clusters, based on the cluster table and dendrogram. The characteristics of each diagnostic parameter in the classified clusters were ascertained by using MS Excel 2007. Fig. 4 shows the characteristics of each diagnostic parameter in the five classified clusters.

All subjects were divided into normal group or patient group and the patient group subdivided into four stages: Grade 1-1, Grade 1-2, Grade 2-1, and Grade 2-2. The 'normal' group was defined as being when pressure difference was more than 5 and the space area was more than 40 at the same time. For the patient group, if the pressure reduction rate was less than 0.1, the data obtained from these patients was classified as Grade 1 and the rest were classified as Grade 2. Among those classified as Grade 1, if the maximum contraction pressure was more than 6 and space area more than 15, the patient was defined as Grade 1-1 and the rest as Grade 1-2. Among Grade 2 patients, if the maximum contraction pressure was more than 5 and space area was more than 10, they were classified as Grade 2-1 and the rest as Grade 2-2. Fig. 5 shows the diagnostic algorithm for urinary incontinence which was established based on the five

classified clusters.

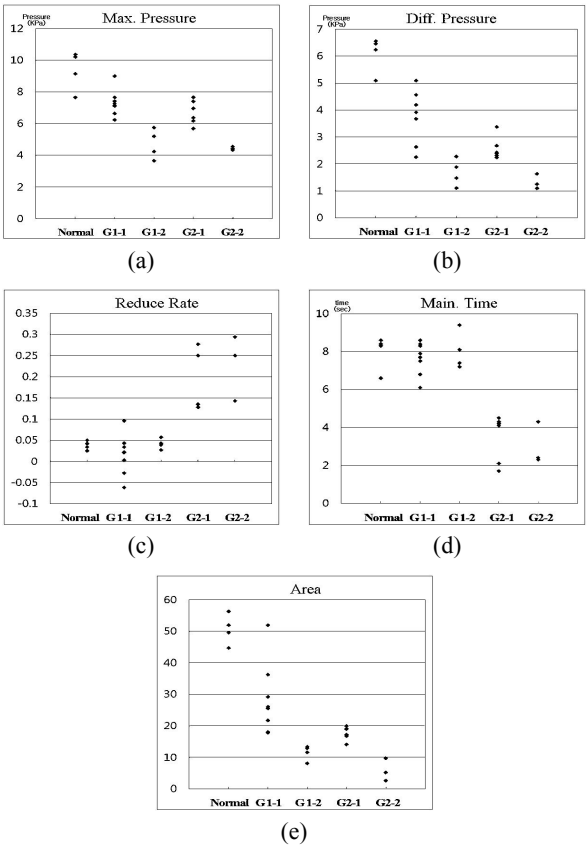

Fig. 4. Classification of patients by five levels on all diagnostic parameters; (a) maximum pressure (b) pressure difference (c) reduce time (d) maintenance time (e) area.

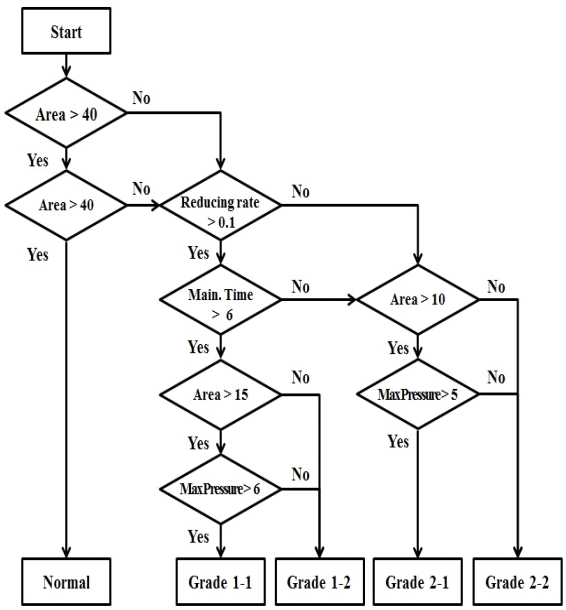

Fig. 5. Flow chart for the diagnostic algorithm.

2. Evaluation of efficacy of the algorithm

In order to evaluate the efficacy of the algorithm explored in this study, the factor analysis, multiple regression analysis, and discriminant analysis were conducted. For the factor analysis, two common factors which could explain all diagnostic parameters were set. Through the multiple regression analysis, the factor scores for each patient could be estimate. And through the discriminant analysis, the linear combination function which has the two common factors as the independent variables was drawn. Table 2 shows the eigenvalue and R-squared value of the two common factors which were drawn from the factor analysis: 67.111% of all diagnostic parameters could be explained through factor 1 and 26.994% could be explained through factor 2. Therefore the two common factors could explain 94.075% of the five diagnostic parameters. In order to analyze the two common factors which resulted from the factor analysis, a factor matrix which indicated the location of each diagnostic parameter was analyzed. Since factor 1 lies at right angles to factor 2, each diagnostic parameter can be shown in the graph where the two axes are factors 1 and 2.

Table 2. Total variance explained

Component		1	2	3	4	5
Initial Eigenvalues	Total	3.356	1.348	.198	.064	.035
	Variance (%)	67.111	26.964	3.953	1.275	.696
	Cumulative (%)	67.111	94.075	98.028	99.304	100
Extraction Sums of Squared Loadings	Total	3.356	1.348			
	Variance (%)	67.111	26.964			
	Cumulative (%)	67.111	94.075			

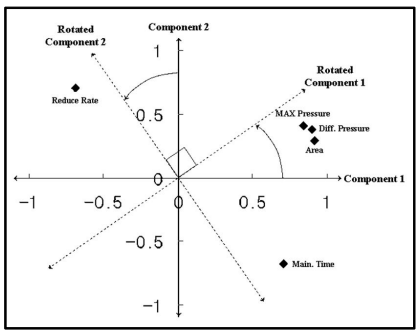

Fig. 6 Component matrix graph.

Fig. 6 shows the non-rotated factor matrix graph and orthogonally rotated graph. In the non-rotated factor matrix graph, the maximum contraction pressure, pressure difference and space area were loaded higher on factor 1 than on factor 2. However, the relationship between the two factors was not clear in terms of pressure reduction rate and duration of maximum pressure. On the other hand, in the orthogonally rotated graph, the maximum contraction pressure, pressure difference and space area were loaded higher on factor 1 and the pressure reduction rate and duration of maximum pressure were higher on factor 2. Given the results above, the factor 1 was a common factor for explaining the maximum contraction pressure, pressure difference, and space area; and that factor 2 was the common factor for the pressure reduction rate and duration of maximum pressure. Because the maximum contraction pressure, pressure difference, and space area were related to the changes in the contraction power of the pelvic floor muscle, and the measurable energy, the factor 1 was named as 'pelvic floor muscle energy'. Likewise, since pressure reduction rate and duration of maximum pressure indicate the degree of maintaining the contraction, the factor 2 was named as 'maintaining power of maximum contraction'. Because factor scores can be used as independent variables for discriminant analysis, the factor scores for each subject could be calculated. With this in mind, the multiple regression analysis was conducted by setting up five diagnostic parameters as independent variables, and the scores of the two factors as dependent variables. Through the multiple regression analysis, the regression equation for the estimation of the factors was arrived at. The equation for the factor 1 is (1) and the equation for the factor 2 is (2). Max means the maximum contraction pressure, and Diff. means the pressure differences. Reduce is pressure reduction rate, and Time is the duration of maximum pressure. Area means the space area.

$$y = -1.598+(1.422\times Max)+(1.268\times Diff.) +(0.446\times Reduce)-(0.329\times Time) +(1.228\times Area) \quad (1)$$

$$y = 0.731-(0.428\times Max)-(0.274\times Diff.) -(2.014\times Reduce)+(1.697\times Time) -(0.098\times Area) \quad (2)$$

The factor scores for each patient's diagnostic parameters could be estimated by using these two equations formed from the results of the multiple regression analysis. These factor scores are used as independent variables for the discriminant analysis in order to arrive at our diagnostic algorithm. Through the discriminant analysis, two discriminant functions can be obtained that utilized the two factor scores as independent variables. The equation (3) and (4) show the discriminant functions respectively:

$$D1 = 2.788\times(Fact1)+2.499\times(Fact2) \quad (3)$$

$$D2 = -1.122\times(Fact1)+1.251\times(Fact2) \quad (4)$$

All subjects' discriminant scores were calculated by using the discriminant functions, and the distribution of the 25 subjects in the area formed was represented by the axis of the discriminant function 1 and the axis of discriminant function 2. Table 3 shows the coefficient of Fisher's linear discriminant function which was formed by each group. The discriminant analysis on the conditions of the classified patients was conducted, making use of the early model of the urinary incontinence diagnostic algorithm. From the coefficient of the discriminant function, the classification function, (5) ~ (9), for each group were extrapolated as shown below.

$$Normal = -19.036+17.644\times(Fact1) +12.147\times(Fact2) \quad (5)$$

$$Grade\,1-1 = -3.866+4.655\times(Fact\,1) +5.911\times(Fact\,2) \quad (6)$$

$$Grade\,1-2 = -5.061-5.692\times(Fact\,1) +0.307\times(Fact\,2) \quad (7)$$

$$Grade\,2-1 = -6.589-7.152\times(Fact\,1) -8.744\times(Fact\,2) \quad (8)$$

$$Grade\,2-2 = -24.425-17.493\times(Fact\,1) -17.948\times(Fact\,2) \quad (9)$$

Table 3. Classification function coefficients

		Fact 1 (Energy)	Fact 2 (Maintenance)	Constant
Diagnosis	1.00 (Normal)	17.644	12.147	-19.036
	2.00 (Grade1-1)	4.655	5.911	-3.866
	3.00 (Grade1-2)	-5.692	.307	-5.061
	4.00 (Grade2-1)	-7.152	-8.744	-6.589
	5.00 (Grade2-2)	-17.493	-17.948	-24.425

3. Clinical evaluation for testing the algorithm

For this study, the Phase II clinical trial was performed at the clinical trial center of Inje University, Pusan Paik Hospital, in order to evaluate the accuracy of the suggested diagnostic algorithm. The subjects were selected by the same method as that used for obtaining the initial data. Thus, the subjects were selected either diagnosed as normal, or diagnosed with stress urinary incontinence Grade 1 or Grade 2. In order to obtain data, the bio-signal measurement system described in this study was used. The contraction pressure data from all subjects were obtained by using the suggested protocol in order to compare identical patterns of data between subjects. A total of 15 subjects participated in this clinical trial: 4 normal subjects, 8 subjects with stress urinary incontinence Grade 1, and 3 subjects with stress urinary incontinence Grade 2. By analyzing fifteen sets of data obtained through this clinical trial, five diagnostic parameters were derived: maximum contraction pressure, pressure difference, pressure reduction rate, duration of maximum pressure, and space area. With these diagnostic parameters, two common factors, ‘pelvic floor muscle energy’ and ‘maximum contraction maintaining power’ were calculated by using linear regression (1) and (2). The diagnosis was made for each patient whose status was at the maximum value when two calculated common factors applied to the classification function (5) ~ (9). The selection of formula among (5) ~ (9) depends on the patient’s status which was determined by the discriminant analysis. When we compared the results of the clinical trial with the results arrived at through the diagnostic algorithm, we found that they were identical at 80% (Normal: 4/4, Grade 1: 5/8, Grade 2: 3/3. Total: 12/15). The false-positive diagnosis was shown as 20%, and the false-negative diagnosis was not confirmed (Table 4). In Fig. 7, the distribution of each subject in the area of space was ascertained: each discriminant score was calculated by using the common factors of the subjects and the discriminant function (3) and (4). Each subject was classified and marked in the area formed by the discriminant function axes 1 and 2. In order to present the diagnosis in the same way as is generally used in clinical diagnosis, the Grades 1-1 and 1-2 were both presented as Grade 1 and the Grades 2-1 and 2-2 were both presented as Grade 2 (Figure 8). After ascertaining the distribution of subjects in each area, we found that the distribution was identical to the classification of the subjects when made by the classification function.

Table 4. Evaluation of the diagnostic algorithm by clinical test

Clinical test	Diagnostic algorithm					Accuracy (%)
	Normal	Grade 1-1	Grade 1-2	Grade 2-1	Grade 2-2	
Normal	4	0	0	0	0	100.0
Grade1	0	3	2	2*	1*	62.5
Grade2	0	0	0	1	2	100.0
Total						80.0

* false-positive diagnosis

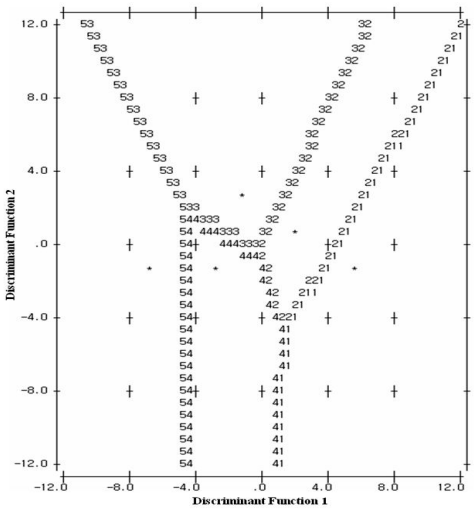

Fig. 7. Territorial map.

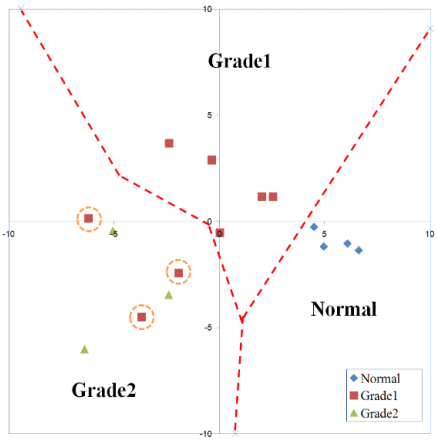

Fig. 8. Distribution of the clinical tests patients on the territorial map.

IV. CONCLUSION

In this study, the diagnostic algorithm which can assess the degree of stress urinary incontinence quantitatively was suggested by measuring the contraction pressure of pelvic floor muscle. The contraction pressure of pelvic floor muscle was measured by using a bio-signal measurement system, and five diagnostic parameters were derived through data analysis. The significance between the normal group and the patient group in all diagnostic parameters was ascertained by t-test. The diagnostic algorithm was defined which would make a diagnosis quantitatively by suggesting a condition for each diagnostic parameter so as to ensure that the data could be classified according to clusters which did not overlap the data of other group. For the classification of the diagnosis of urinary incontinence, the Stamey's clinical classification was divided further with the five stages of stress urinary incontinence: Normal, Grade 1-1, Grade 1-2, Grade 2-1, and Grade 2-2.

By comparing the clinical diagnosis with the diagnosis using the algorithm, the 80% identicalness was verified. Furthermore, the diagnosis of stress urinary incontinence through our diagnostic algorithm was more accurate than diagnoses made through urodynamic tests, such as an intravesical pressure test, uroflowmetry, and a leak point pressure test. With these result, the measurement protocol and the diagnostic algorithm for urinary incontinence which are suggested in this study could be developed as a self-urinary incontinence diagnostic tool. Since the changes in contraction pressure of the pelvic floor muscle are ascertained in real-time, the measurement protocol and diagnostic algorithm could also be used for the development of biofeedback equipment for the treatment of urinary incontinence.

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복압성 요실금의 정량적 평가를 위한 진단 알고리즘에 관한 연구

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요 약

골반저근은 골반기관을 지지하는 기능을 가지고 있으며 요자제를 유지하는 여성의 주요 하부조직이다. 골반저근의 약화는 복압성 요실금의 원인이 되는데, 이러한 골반저근의 기능 정도는 복압성 요실금의 병증 정도를 평가하는 지표로 사용될 수 있다. 이에 본 연구에서는 골반저근의 수축 압력을 측정하여 복압성 요실금의 병적 진행정도를 정량적으로 진단할 수 있는 요실금 진단 알고리즘을 제안하였다. 이를 위하여 골반저근의 수축압력 정보를 측정할 수 있는 시스템을 제작하였으며, 측정된 데이터의 특징 분석을 위한 측정 프로토콜을 제안하였다. 복압성 요실금 환자로부터 획득한 데이터를 이용하여 5개의 진단 파라미터를 추출하였으며, 이를 이용한 진단 알고리즘을 구현하였다. 임상시험을 통하여 진단 알고리즘의 정확성을 평가한 결과 80%의 정확성을 보였으며, 20%의 위양성 진단 결과를 보였다. 반면에 위음성 진단 결과는 확인되지 않았다. 본 연구에서 제안한 요실금 진단 알고리즘은 복압성 요실금의 병적 진행 정도를 정량적으로 진단할 수 있으며, 요실금 진단 시스템 개발에 활용될 수 있을 것으로 판단된다.

중심단어: 골반저근, 복압성 요실금, 진단 알고리즘, 진단 파라미터